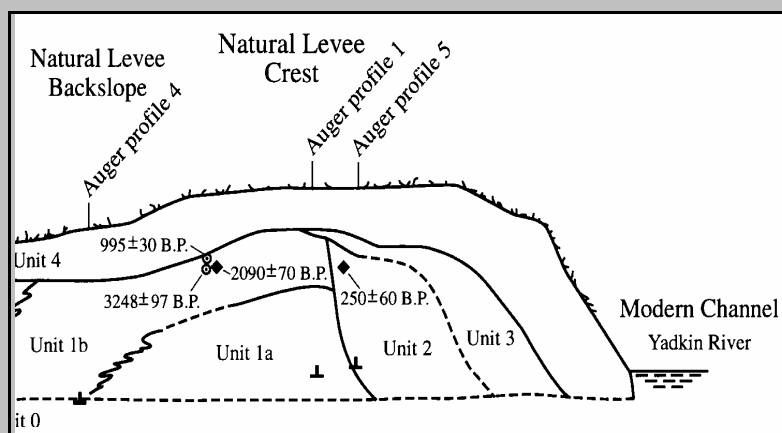


Southern Indian Studies



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GEOMORPHOLOGICAL AND ARCHAEOLOGICAL INVESTIGATIONS OF A BURIED SITE ON THE YADKIN RIVER FLOODPLAIN

by

Paul A. Webb and David S. Leigh

Abstract

This article summarizes the results of recent investigations at a buried prehistoric site (31De169) on the Yadkin River floodplain in Davie County, North Carolina. The research included shovel testing, augering, and hand and backhoe trenching of the floodplain, and obtained considerable data on the depositional history of this part of the Yadkin Valley. The project data provide insights into the factors involved in the preservation and discovery of archaeological sites in alluvial settings, and in conjunction with other recent research (e.g., Gunn 1991, 1993) demonstrate that archaeological sites are preserved within floodplains in a variety of depositional environments. In addition to gathering data relevant to those issues, the fieldwork documented the presence of an Early Woodland component buried beneath up to 1.6 m of historic-period sediments. Most of the recovered artifacts consist of fragments of a single Badin Cord-Marked vessel, which was recovered from a buried surface radiocarbon dated to $2,090 \pm 70$ B.P. (Beta-77252).

Site Preservation and Discovery in Floodplain Environments

The factors affecting site burial in the Carolina Piedmont have been a topic of discussion for over three decades, since Coe (1964) published his pioneering research in the Yadkin and Roanoke drainages. At the Doerschuk site on the Yadkin River, for example, Coe determined that the preservation of cultural deposits was largely due to the site's position immediately below the Narrows, a four-mile long reach in which the river cut a gorge through bedrock outcrops. At Doerschuk, the channel slope decreased and its bed widened considerably, resulting in the deposition of substantial amounts of alluvium. The repeated deposition of those sediments preserved evidence of numerous Archaic and Woodland period occupations and provided the stratified record that enabled Coe to construct a cultural sequence for the Carolina Piedmont.

Subsequent research by Claggett and Cable (1982) in the Haw River drainage (east of the Yadkin) expanded on Coe's work. The Haw River sites were situated in a generally similar depositional environment to Doerschuk, in an area where the river gradient changed from steep to gentle as the river left the Piedmont and entered the Coastal Plain (Claggett and Cable 1982:146). The authors pointed out that similar depositional settings likely existed elsewhere in the Piedmont (not just at fall line locations), and that deeply buried, stratified deposits might be expected in those areas as well.

More recently, Gunn (1991, 1993) has employed those observations in formulating a general model that predicts the locations of depositional environments in Piedmont river valleys. According to this model, sediment deposition and levee formation are expected primarily at locations below narrows, or chokes, where the relatively unconstricted nature of the river bed facilitates low stream flow velocities. The resulting levees would be expected to be oldest at the upstream end, nearest the choke, and youngest at the downstream end. A second likely site location would include broad areas above chokes, which are termed coves. The floodplain width in coves, coupled frequently with the confluence of the stream with tributaries unable to breach the resistant rock ridges forming the chokes, creates slackwater environments that facilitate the accumulation of sediment and provide an excellent environment for site burial (Gunn 1993:16, 19).

The processes described above have played a role in site burial throughout the Holocene, but the rate of sediment deposition has increased dramatically during the past two centuries. The widespread erosion of Piedmont uplands and the resulting increase in stream sediment load and sediment deposition on floodplains due to historic-period land-use practices have been widely documented (e.g., Trimble 1974). Regional archaeologists have recognized that both prehistoric and historic alluvial deposits have potentially buried archaeological sites, and frequently have designed survey and testing strategies accordingly. Several previous projects in the Yadkin drainage have used various techniques to search for buried sites, and at least one has involved salvage excavations of stratified deposits in the Yadkin floodplain.

During the survey for the proposed Wilkesboro (W. Kerr Scott) reservoir in Wilkes County, Bennie Keel (1963) and his associates (Broyles 1960) dug deep test units at several floodplain sites to search for deeply buried deposits. At one site, 31Wk54, researchers documented the presence of at least 2.4 m of historic-period alluvium overlying

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Woodland-period deposits. Keel (1963:23) concluded that "the excavation of this site shows that many later sites are probably buried in the flood plain of the Yadkin River and other streams where similar conditions exist."

A few years earlier, in 1958, Stanley South of the University of North Carolina at Chapel Hill carried out salvage excavations at 31De1, on the Yadkin River floodplain approximately 400 m north of the present project area. Sand quarry operations at that location had encountered human burials, and the salvage work documented both Late Woodland and stratified Archaic deposits. The Late Woodland remains were associated with Dan River ceramics and were apparently only a short distance below the surface. The earliest artifact identified was a Middle Archaic period Morrow Mountain point, which was found about 1.3 m below the surface in general association with several hearths and a pitted stone. At least two distinct strata and associated hearths were identified below that stratum but they did not produce diagnostic artifacts (South 1958). Interestingly, there was no evidence of substantial historic-period alluvium at that location.

Subsequent researchers have used a variety of methods to search for sites buried in the floodplain of the Yadkin and adjacent streams. Keel conducted limited hand-dug excavations to more than 2.7 m below the surface at the Forbush Creek site (31Yd1) but found no trace of buried materials (Coe 1972:4). Wake Forest University's research in the Great Bend area has included systematic auger testing (to 2 m below surface at 100-m intervals) to locate buried sites, as well as excavations at the McPherson site, which was buried beneath about 40–50 cm of alluvium (Woodall and Weaver 1990). Investigators have also used backhoe testing to search for buried deposits elsewhere along the Yadkin and its tributaries (e.g., Abbott 1987; Woodall 1992), and others have used shovel tests or auger tests to search for buried sites in the floodplain near the project area (e.g., Glover 1993; Lautzenheiser 1988).

Although previous attempts to locate buried deposits in the Yadkin drainage have met with mixed success, there is little doubt that the extensive exposures afforded by systematic backhoe trenching are extremely effective in locating archaeological sites buried beneath overlying alluvium. But despite its usefulness, in many situations backhoe use is constrained by conditions beyond the researcher's control.

In the experience of the authors, these conditions have included the lack of physical access due to environmental conditions and the lack of permission due to landowner concerns or the potential impacts to

wetlands or other protected resources. In other circumstances, the use of extensive backhoe testing may be impossible due to funding constraints. In the present project, initial shovel testing coupled with limited hand trenching was followed by backhoe trenching. Consequently, in addition to providing geomorphological and archaeological data the work gives insight into the relative efficacy of those techniques in identifying and assessing archaeological sites in floodplain environments.

Project Setting

The project area is located in the Yadkin River floodplain of Davie County, in the western Piedmont of North Carolina (Figure 1). The Yadkin is one of the principal Piedmont rivers, and rises on the eastern edge of the Blue Ridge mountains, in Watauga County to the northwest of the project area. It then flows to the east-northeast for approximately 120 km before turning to the south at a point about 30 km (straight-line distance) north of the project area. The area where the Yadkin turns to the south is known as the Great Bend. Immediately above that point the river passes through a 5-km stretch marked by prominent shoals and narrow expanses of floodplain; below the bend wider expanses of floodplain are present, largely on the west (Yadkin and Davie counties) side of the river.

The project area is situated a few meters south of the U.S. Highway 158 bridge, about 7 km west of the town of Clemmons and 2 km east of the community of Hillsdale. At this point the valley is about 260 m wide. The bankfull river channel is about 100 m wide and 6 m deep, and is situated against the eastern edge of the valley, forming a gentle meander bend. No terraces are present above the floodplain level. The gradient of the channel is about 5 m per kilometer, or about 0.5 percent. The elevation of the floodplain in the project area is about 240 m (790 ft); during low flow the floodplain is about 2.5–5.0 m above the river level. U.S. Geological Survey stream gauging data recorded downstream at Yadkin College indicate that the entire valley floor is inundated by the 2-year recurrence interval flood, or floods that have a 50 percent probability of occurring each year.

Topographic relief in the floodplain at the project area primarily is expressed by a prominent natural levee that becomes higher in elevation and more distinct upstream to the north. The project corridor traverses

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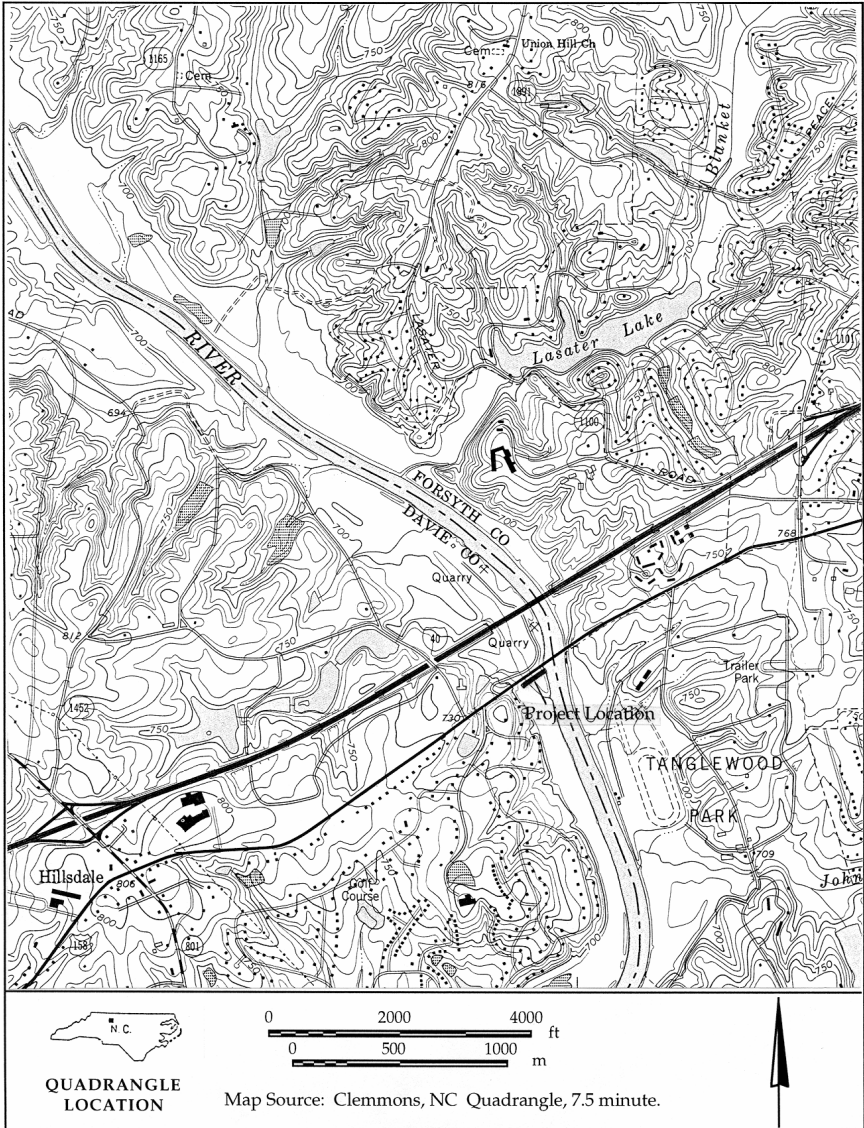


Figure 1. Location of Site 31De169, Davie County, North Carolina.

the extreme downstream nose of the levee as it tapers off to the south. The crest of the natural levee is adjacent to the river channel and gradually decreases in elevation along the backslope of the levee to a backswamp on the western side of the floodplain. Total relief between

the surface of the backswamp and the natural levee crest is 2.4 m. A 2.5-m deep tributary channel flows through the backswamp and exhibits its own natural levee. A small remnant of older floodplain sediment is present along the extreme western margin of the valley, at the same elevation as the crest of the natural levee.

The project corridor is only about 15 m wide, and consists of a ca. 6.1-m wide permanent natural gas pipeline right-of-way and an adjacent ca. 9.1-m wide construction easement (Figure 2). The section of floodplain crossed by the corridor is presently covered with mixed grasses, underbrush, and small saplings, primarily box elder. Mature hardwoods are present along the edge of the river and the stream channel crossing the floodplain. Local residents report that the area was formerly used as pasture, but has been allowed to grow up over the last few years.

History of Research

Survey

The initial field survey of the project area was carried out in July of 1994. Since the survey corridor consisted primarily of floodplain, the survey techniques were designed to search for both shallow and deeply buried sites. The survey began with the excavation of 10 systematic shovel tests, generally at 15-m intervals along the project centerline. The tests were excavated to sterile subsoil (in the uplands at the west end of the transect) or to depths of up to 125 cm in the floodplain. The walls of each pit were inspected for artifacts, features, and other indications of archaeological deposits, and the soil was screened through 1/4-inch mesh.

Only one of the 10 shovel tests recovered a possible prehistoric artifact. Shovel Test 2, located approximately 35 m west of the riverbank, produced an apparent quartzite flake fragment at 64–103 cm below surface. Three other shovel tests situated on the highest part of the levee produced historic-period artifacts (including wire or nails, a bolt, unidentified metal fragments, and asphalt and concrete fragments) at about 60 cm below surface.

Following the shovel testing, three 2-x-0.75-m trenches were hand-excavated at 15-m intervals along the right-of-way in the higher part of the floodplain. (It was necessary to rely on the hand trenches for initial deep testing, as permission for backhoe testing was lacking at that time.)

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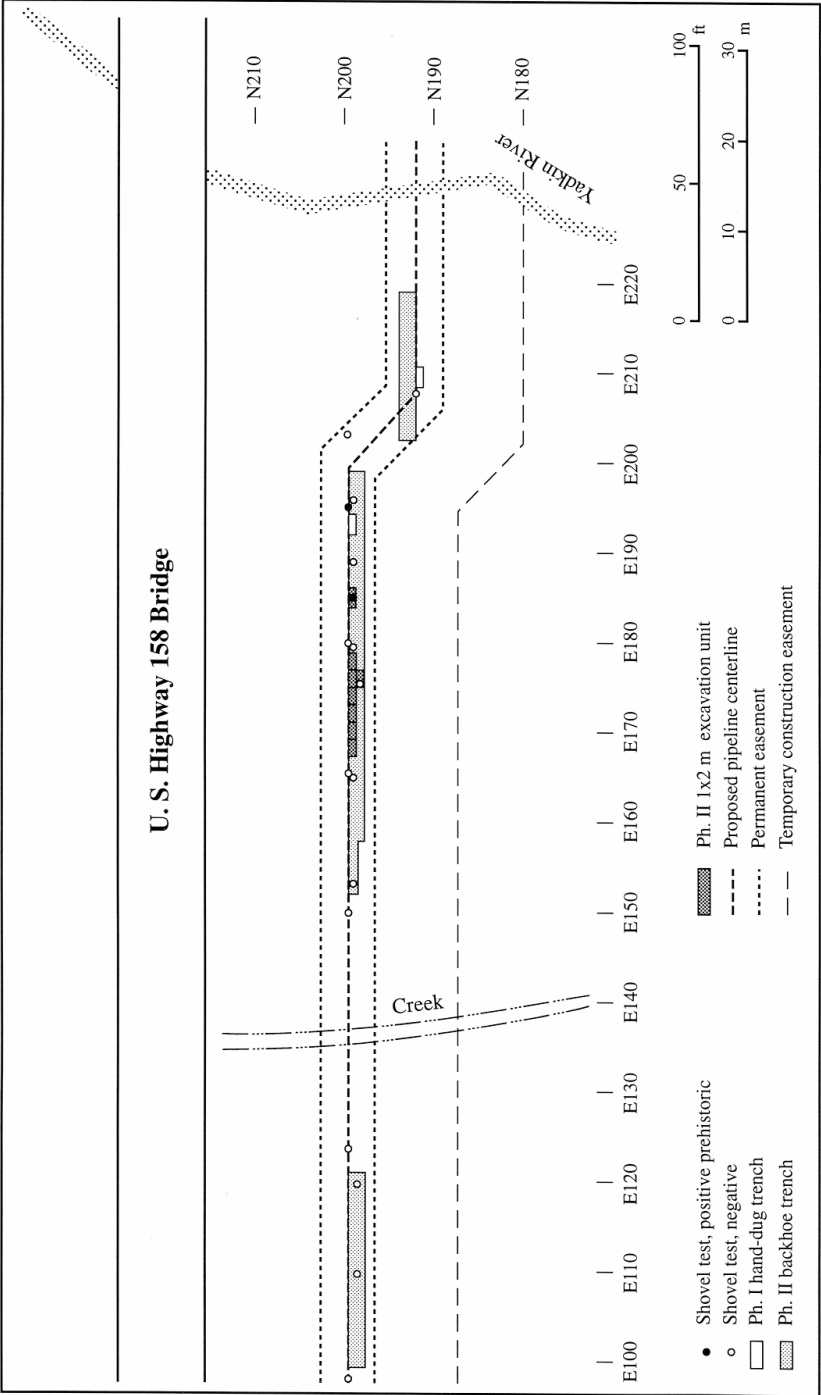


Figure 2. Location of Project Corridor and Excavations at 31De169.

Trench A was placed about 10–12 m west of the riverbank, while Trench B was located about 27–29 m west of the bank, on the top of the levee. Trench C was situated on the backslope of the levee, about 15–17 m west of Trench B and 44–46 m west of the riverbank. Most of the soil from the trenches was removed without screening, although samples of the historic-period deposits, and the prehistoric materials discovered in Trench C, were screened. When sediments were not screened, care was taken to inspect both the profiles and removed soil for artifacts or other indications of occupations.

Trenches A and B were excavated to maximum depths of 2.91 m and 2.60 m. Both trenches encountered the historic-period deposits that had previously been identified in the shovel tests, but failed to encounter prehistoric artifacts or evidence of former occupation surfaces. In contrast, Trench C encountered a light scatter of prehistoric lithic and ceramic artifacts at a depth of about 130–150 cm, within an apparent historic plow zone. Subsequently, at about 150 cm below surface the trench encountered a stratum of brown-to-dark-brown (10YR 4/3) silt loam, which appeared to be confined to the west half of the trench. This stratum overlay a mottled, yellowish brown (10YR 5/4) silt loam that contained 21 prehistoric ceramic sherds. A pronounced stain and charcoal concentration, representing a possible cultural feature, were observed within that deposit and designated Feature 1. Due to the difficulty in working in the confined trench and the fact that the deposits clearly warranted further work, excavation was suspended and the trench backfilled.

Phase II Testing

The Phase II investigations at 31De169 were conducted in August of 1994. The objectives of the testing were to provide data on the site's extent, integrity, age, and function, as well as to gather data on the geomorphological and archaeological contexts of the identified artifacts and deposits.

Following the establishment of a metric grid, a backhoe with a 3-ft wide, toothless bucket was used to excavate approximately 80 m of trenches along the pipeline centerline (Figure 3). The trenches varied from 1–2 m in width and from 60–280 cm in depth, depending on the nature of the sediments encountered. The entire profile of the trench was closely inspected, and approximately 47 m of profile were cleaned, photographed, and mapped (Figure 4). A total of 40 m² of the trench

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Figure 3. Backhoe Trenches at 31De169 (view to southwest).



Figure 4. Phase II Excavations in Progress (view to northwest).

floor was cleaned and examined for features, and 16 m² of deposits were hand excavated within eight 1-x-2-m test units. At the conclusion of the investigations, nine additional shovel tests were excavated in the base of the backhoe trench to search for more deeply buried deposits within prehistoric stratigraphic units. Geomorphological investigations were conducted in conjunction with the fieldwork, including coring, augering, and evaluation and recording of the exposed trench and unit profiles.

The combined investigations produced considerable data on the geomorphological and archaeological deposits at the site, and documented the presence of a buried Early Woodland component represented by Badin Cord-Marked pottery and associated artifacts. The Early Woodland materials were situated in the upper 40 cm of a levee surface that was buried beneath as much as 1.6 m of historic-period flood deposits. The following sections present information on the prehistoric materials and their context, beginning with a discussion of the floodplain geomorphology.

The Geomorphological Context of 31De169

Stratigraphy

The geomorphological stratigraphy in this section of the Yadkin River floodplain consists of historic-period sediments that drape the entire valley floor and bury four older alluvial units. The principal stratigraphic units present in the floodplain are shown in Figure 5, which is a profile along the pipeline centerline based on data derived from the backhoe trenches, coring, and augering. Detailed descriptions of the stratigraphic units are provided in the following paragraphs and tables.

Unit 0. Stratigraphic Unit 0 consists of basal sands and gravels of the alluvial fill in the Yadkin River valley. Auger Profile 2 was the only subsurface test that penetrated this unit; at that location (ca. N205 E133) Unit 0 consisted of gray (5Y 6/1), very coarse sand and pea gravel. The thickness of this unit is unknown, but its lateral extent is probably across the entire valley, which is typical of Holocene valley fills. The sand and gravel of this unit probably overlie bedrock. The top elevation of Unit 0 in the auger profile is at approximately the same elevation as the base of the river, suggesting a fairly level projection of this unit across the entire valley. The absence of Unit 0 in other profiles indicates that this unit does not occur significantly above the elevation of the present

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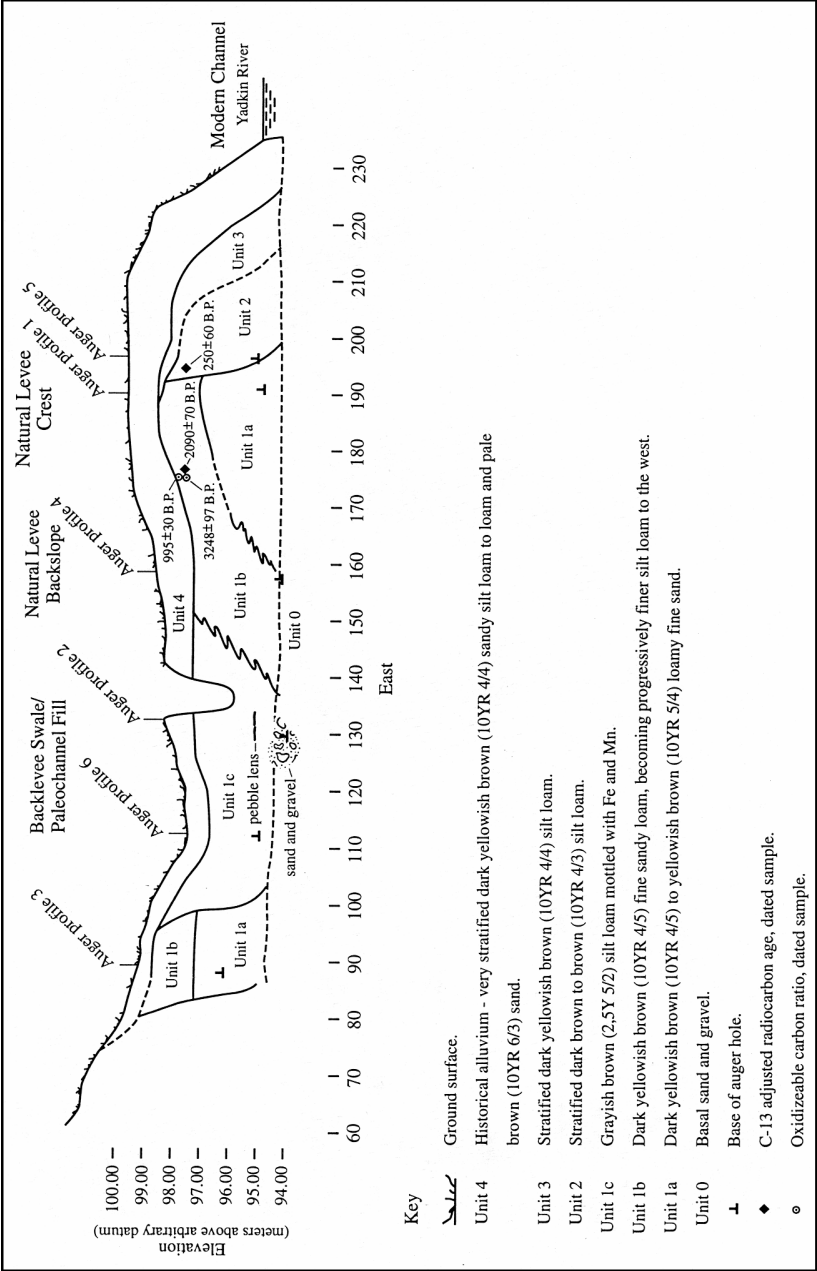


Figure 5. Stratigraphic profile of the Yadkin River floodplain at 31De169.

riverbed. Relatively fine-textured Units 1, 2, 3, and 4 abruptly overlay nit 0.

Unit 0 represents channel lag sediments that are time transgressive (possibly 10,000 B.P. to present) and are overlain by lateral accretion and vertical accretion sediments. Since this unit is made up of bedload sediments that were deposited under high-energy flow conditions, it offers very little to no potential for preservation of *in situ* cultural materials.

Unit 1. Stratigraphic Unit 1 consists of yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/5) loamy fine sand that grades upward to fine sandy loam and silt loam. The entire unit is massive with no distinct primary sedimentary structures, and the massive sedimentary structure has been altered to pedogenic structures by soil weathering during the Holocene. This unit ranges from 4.0 m thick at the crest of the natural levee to about 2.5 m thick in the backswamp paleochannel fill. Unit 1 is laterally extensive across the western two-thirds of the floodplain (about 100 m) and is subdivided into three separate facies (designated 1a–1c); these facies comprise a sedimentary continuum of loamy fine sand to silt loam that resulted from the lateral migration of the river channel and the associated aggradation of floodplain sediment. Unit 1a consists of loamy fine sand that is graded upward to the fine-textured sandy loam and silt loam of Unit 1b. This graded sequence represents the transition from bedload and point bar sediments of Unit 1a to vertical accretion overbank sediments of Unit 1b. The boundary between Units 1a and 1b is gradual and conformable. Unit 1c consists of fine-textured (silt loam), vertical accretion sediments that were deposited in the paleochannel and backswamp of the floodplain. Unit 1c conformably grades into the fine-textured backlevee sediments of Unit 1b.

Unit 1 is pedogenically altered throughout most of its thickness and contains a soil with a moderately well-developed Bt horizon in Units 1b and 1c. The A horizon of the soil has been disturbed by plowing throughout most of the transect studied, but a small portion of apparently unplowed A horizon material occurs on the backslope of the natural levee between about N200 E152–176 (Figure 6). The soil in Unit 1 is a paleosol, having been buried by historical sediments of Unit 4. It consists of a continuous toposequence that grades from a poorly drained and mottled soil in the backswamp of Unit 1c to a well-drained solum on the crest of the natural levee of Unit 1b. Profile descriptions that represent the end members of this toposequence are presented in Tables

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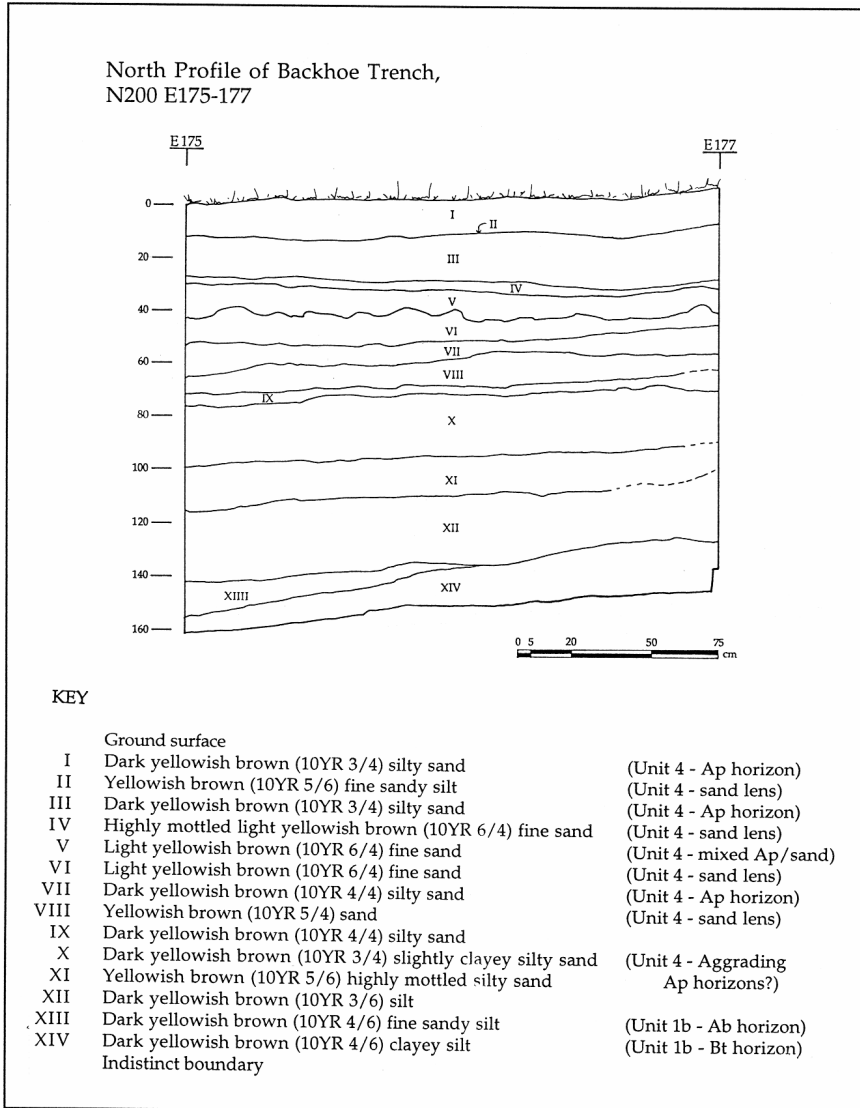


Figure 6. Detail of soil profile, showing buried A horizon and historic plow zone.

1 and 2. The soil in Unit 1 would probably be classified as an Ultisol or possibly an Alfisol if its base status were high enough.

The Bt horizon and solum thickness indicate that Units 1b and 1c probably postdate 10,000 B.P., based on limited data concerning the time

Table 1. Soil Description of Profile #1 (ca. N200 E190).

Depth (cm)	Horizon	Description
0–104	A C	Historical alluvium (Stratigraphic Unit 4) with 10YR 4/3 silt loam A horizon (0–10 cm) over laminated and stratified 10YR 7/2 fine and medium sand interbedded with 10YR 4/4 silt loam; majority of sand beds are above 63 cm depth.
104–121	2BCb	(Stratigraphic Unit 3) 10YR 5/4 loamy fine sand, weak fine subangular blocky, few flecks of charcoal, top of prehistoric bearing sediments; A horizon was probably plowed off, clear lower boundary.
121–151	3Bt1b	(Stratigraphic Unit 1b) 10YR 4/5 fine sandy loam, common thin clay cutans coating and bridging sand grains, weak medium subangular blocky, gradual boundary.
151–199	3Bt2b	(Stratigraphic Unit 1b) 10YR 4/5 loam, common thin to moderately thick cutans on ped faces and sand grains, moderate medium subangular blocky, gradual boundary.
199–250	3Bt3b	(Stratigraphic Unit 1b) 10YR 4/5 loam to fine sandy loam, thin cutans bridging and coating sand grains, weak fine subangular blocky, gradual boundary.
250–425	3Cb	(Stratigraphic Unit 1a) 10YR 4/5 to 10YR 5/4 fine and medium loamy sand, massive, gradual boundary.
425–475+	3Cgb	(Stratigraphic Unit 1a) 2.5Y 6/2 fine and medium loamy sand, mottled with Fe and Mn, base of auger hole.

required for Bt horizon development in the Southeast and elsewhere (Birkland 1984; Foss et al. 1981; Markewich et al. 1989; Segovia 1981).

The presence of Early Woodland ceramics in the upper 40 cm of Unit 1b suggests that active sedimentation continued until about 2,000 B.P. or later, which is compatible with a C-13 adjusted radiocarbon date of 2,090±70 B.P. (140±70 B.C., Beta-77252) that was obtained on a burned sweetgum stump in the upper part of this horizon (see below). The Holocene age of Unit 1 suggests high potential for cultural material to exist throughout the thickness of this unit, particularly in Units 1b and 1c.

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Table 2. Soil Description of Profile #2 (ca. N205 E133).

Depth (cm)	Horizon	Description
0–105	A C	Historical alluvium (Stratigraphic Unit 4), 10YR 4/4 sandy silt loam, 10 cm thick 10YR 4/3, A horizon at top, massive, clear boundary.
105–200	2Btb	(Stratigraphic Unit 1c) 10YR 4/5 heavy silt loam to silty clay loam, thin to moderately thick cutans on ped faces, moderate medium subangular blocky, gradual boundary.
200–260	2BCgb	(Stratigraphic Unit 1c) 2.5Y 5/2 heavy silt loam, mottled with 2.5Y 7/2 and 10YR 5/8, weak fine subangular blocky to massive, gradual boundary.
260–370	2Cg1b	(Stratigraphic Unit 1c) 2.5Y 5/2 heavy silt loam, mottled with Fe and Mn, massive.
370–415	2Cg2b	(Stratigraphic Unit 1c) 5Y 5/1 silt loam interbedded with thin sand lenses and one pebble lens, massive.
415–420+	3Cgb	(Stratigraphic Unit 0) 5Y 6/1 very coarse sand and pea gravel, base of hole.

Unit 2. Stratigraphic Unit 2 consists of brown (10YR 4/3) sandy loam that is graded upward to silt loam. Maximum thickness is about 3.5 m, and maximum lateral extent is about 15 m. The upper part of the unit is massive and becomes stratified with depth. Lateral contacts indicate that this unit represents a cut-and-fill deposit that resulted after the Yadkin River migrated to the west and eroded part of Units 1a and 1b and then migrated back to the east, depositing Unit 2. Thus, this unit is time-transgressively younger to the east and contains point bar sediments overlain by overbank, vertical accretion deposits. Soil development in this unit is minimal and is characterized by organic enrichment and weak pedogenic structure. Classification would probably be as an Entisol or Inceptisol. Although a small number of Woodland-period artifacts were recovered from this deposit, it also produced a C-13 adjusted radiocarbon date of 250±60 B.P. (A.D. 1700±60, Beta-76119), indicating that it is

protohistoric or historic in age. Unit 2 is unconformably overlain by Unit 3 and lateral contacts with Unit 3 were covered.

Unit 3. Stratigraphic Unit 3 consists of massive, dark yellowish brown (10YR 4/4) silt loam that becomes stratified with beds of light gray (10YR 7/2) fine sand with depth. This unit has a maximum thickness of about 3.5 m and a lateral extent of about 10 m. Like Unit 2, it represents point bar and overbank sedimentation that was deposited as the Yadkin River migrated to the east. Unit 3 is conformably overlain by and laterally interfingers with historical sediments of Unit 4 and probably represents early historic sedimentation at the site. Soil development in Unit 3 is negligible, and it would be classified as an Entisol. The stratigraphic position of this unit suggests that it dates to the historic period. No artifacts were recovered from this unit, although it would be expected to have high potential for burial of artifacts if occupation occurred during the time of sedimentation of the unit.

Unit 4. Stratigraphic Unit 4 consists of dark yellowish brown (10YR 4/4) silt loam to sandy loam beds that are interstratified with light gray (10YR 7/2) fine sand. Historic-period artifacts in this unit, as well as plow scars in the top of Unit 1b beneath it, indicate an historic age (after ca. A.D. 1780). Unit 4 makes up a continuous surficial deposit at the site that ranges in thickness from about 0.5 m to 4.5 m. Across most of the site this unit represents successive deposits of overbank flooding, and several distinct, superimposed plow zones can be distinguished within it (see Figure 6). At the eastern end of the valley floor where the unit is thickest (4.5 m), channel bank facies are present that dip toward the channel bed. On the floodplain this unit ranges from 0.5 m to 1.7 m in thickness, and it abruptly and unconformably overlies Units 1 and 2.

Some information on the deposition of the historic-period sediments is provided by the historic artifacts contained within them. Over 90 percent of the 49 historic artifacts recovered derive from a single, horizontally discrete context, consisting of one of the buried plow zones (Ap horizons) within Unit 4. That horizon ranged from about 46–56 cm below surface at N200 E192 to over 150 cm below surface at N193 E219, and appears to represent a plow zone that was stable for an extended period of time. In addition to the recovered artifacts, it contained many small gravel, concrete, and asphalt fragments. Those materials are likely related to a paved road that was constructed a short distance to the north in the 1910s, and may derive from a bridge that was constructed in 1914 and destroyed by flooding in 1940. Of the other three artifacts, one (a 1960s soft drink bottle) came from the base of the

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uppermost plow zone, about 18–22 cm below surface. The other two artifacts, both unidentified nail fragments, came from lower plow zones.

Like Unit 1, Unit 4 becomes thinner and finer textured toward the west into the backswamp portion of the floodplain. Stratification and sedimentary structures also disappear toward the west. Stratification is very distinct from the channel bank toward the crest of the natural levee and grades into massive silt loam (without stratification) to the west into the backswamp. In the eastern part of this unit, near N192 E210, some of the sand beds exhibit cross bedding indicative of water flow to the west across the natural levee during extreme floods. Part of the sediment in Unit 4 at the extreme western edge of the valley is colluvium, derived from surface wash off of the adjacent hillside. Like Unit 3, soil development in Unit 4 is negligible, and this unit would be classified as an Entisol.

Depositional History

The depositional history at 31De169 primarily involves lateral migration of the Yadkin River channel to the east during the middle Holocene, followed by a brief interval of lateral cutting back slightly to the west during the late prehistoric or protohistoric period, and finally lateral migration about 30 m back to the east during historic times. Age estimates are approximate and are based on soil development and limited age control provided by artifacts and radiocarbon dates. However, the sequence of channel migration and sedimentation patterns at the site are well expressed by the stratigraphy.

During the early to middle Holocene the Yadkin River probably was situated along the western edge of the valley, in approximately the same position as Unit 1c. At that time Unit 1a and some of Unit 1b had already been deposited along the extreme western edge of the valley, along with alluvium on the eastern side of the channel. At some time during the middle Holocene, the river rapidly migrated laterally to the east, depositing Unit 1a and part of Units 1b and 1c on the western side of the migrating channel. At the same time the eastward channel migration eroded pre-existing alluvium along its cutbank (eastern bank). At about 5,000 to 2,000 B.P. the channel probably had situated itself in about the same position as it is now and progressively deposited most of the paleo-natural levee of Unit 1b as well as the backswamp facies of Unit 1c. At some later time the channel migrated 10 to 20 m back to the west and laterally eroded a small part of Unit 1, then reversed its

migration back to the east and deposited Units 2, 3, and 4 during the protohistoric and early historic period. During the time of deposition of Unit 2 a small amount of sediment probably was contributed to the top 20 to 40 cm of Units 1b and 1c.

Within this depositional framework, the remnants of Units 1a and 1b at the western edge of the valley are probably the oldest alluvial units and perhaps date to about 6,000 to 7,000 B.P. Units 1a, 1b, and 1c represent time-transgressive sedimentation and buildup of the natural levee and backswamp between about 6,000 and 2,000 B.P. Units 2, 3, and 4 represent sedimentation during a period after the channel cut back slightly to the west and then migrated to the east, and they apparently date after about 250 B.P. The extensive historic-period sedimentation on the natural levee reflects changing hydrologic conditions due to settlement, development, and land use in the watershed that have induced more extreme, or higher frequency, flooding than was typical in prehistoric times.

In summary, most of the sediments in the area of documented prehistoric occupation consist of levee sediments that were deposited when the river was to the east of the site, although perhaps slightly to the west of its present position. Most of these sediments are probably early to middle Holocene in age. Minor deposition of sediment continued following the major occupation, which appears to have occurred during the Early Woodland period. The eastern portion of the levee was subsequently cut by the river, and historic-period plowing truncated the top of the prehistoric land surface as well. Subsequent deposition of predominantly coarse-grained sediments during the historic period sealed the truncated prehistoric land surface beneath up to 1.6 m of sediment.

The Early Woodland Occupation at 31De169

The survey and testing documented a localized, moderate-density scatter of Early Woodland period artifacts on the backslope of the buried levee, within the upper part of Stratigraphic Unit 1b. A few scattered prehistoric artifacts also were recovered slightly deeper in Unit 1b, from the historic-period plow zones (Unit 4), and from Unit 2, the channel fill to the east. The following discussion presents data and interpretations concerning the nature and distribution of the possible cultural features, the artifacts and archaeobotanical remains, and the chronology and nature of the occupation.

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Features

Three possible cultural features were recognized during the excavations. Only one (Feature 4) is likely of cultural origin; a second feature could be either natural or cultural in origin. The third feature (Feature 1) is of natural origin, but produced charcoal providing an approximate date for the prehistoric occupation.

Feature 1 was first recognized in Trench C, the third of the hand-dug trenches excavated during the Phase I survey (see Figure 2). At that time its nature and boundaries were unclear, and it was considered to encompass the Ab horizon at the top of Stratigraphic Unit 1b as well as an amorphous stain extending beneath that horizon. During the testing, this feature was redefined as an irregularly shaped, but nearly circular, stain extending beneath the Ab horizon. This stain consisted of grayish brown (2.5Y 5/2) loamy, charcoal-flecked clay, and contained a pocket of dark grayish brown (10YR 4/2) silty clay loam. Upon excavation, the feature proved to be irregular in form and associated with at least two distinct root stains extending 30 cm or more into the underlying soil. Archaeobotanical analysis of 12.4 g of wood charcoal derived from a flotation sample revealed 28 fragments of sweetgum (*Liquidamber styraciflua*) and two fragments of oak (*Quercus* sp.) wood; analysis of an additional 3.8 g of hand-picked charcoal produced an additional 25 fragments of sweetgum. Consequently, this feature is interpreted as a burned sweetgum stump. A C-13 adjusted radiocarbon date of $2,090 \pm 70$ (140 ± 70 B.C.) was obtained on a sample of sweetgum charcoal from the feature. The two-sigma range of 280–0 B.C. for this assay (357 B.C.–A.D. 72 when calibrated [Stuiver and Reimer 1993]) is believed to provide an acceptable date for both the stump and the associated land surface.

The only artifacts recovered from the feature fill were eight ceramic sherds, including six sherds from Vessel 1. The sherds potentially could either predate or slightly postdate the tree stump, but the overall stratigraphic association of the stump and the vessel fragments in the surrounding horizon suggests that they were roughly contemporaneous.

Feature 2 was recognized at the top of Stratum 1b during excavation of the backhoe trench, and appeared as a roughly oval area of burned soil. The feature fill consisted of strong brown (7.5YR 4/6) silt containing numerous flecks of charcoal and oxidized, yellowish red (5YR 4/6 to 5YR 5/8) silty clay. The stain extended 28 cm into the underlying soil and was tentatively interpreted as a burned tree root.

Archaeobotanical analysis of 4.8 g of wood charcoal revealed 15 fragments of chestnut (*Castanea dentata*) and five fragments of oak. This mixture of wood types suggests that the feature might in fact be cultural in origin, but no artifacts were recovered from the feature fill.

Feature 4 was recognized in the upper part of Stratum Ib, immediately beneath the buried Ab horizon. The feature consisted of a loose cluster of two fire-cracked quartzite cobbles and two apparently unmodified quartzite cobbles. There was no visible soil staining associated with the cluster, and a 1-x-1-m block surrounding the cobbles produced no other artifacts. Flotation of a 12-liter sample of soil surrounding the rocks produced a small quantity of archaeobotanical remains, including 5.3 g of wood charcoal and a trace amount (<0.1 g) of hickory nutshell. Analysis of the wood charcoal revealed 25 fragments of oak, three fragments of black locust (*Robinia pseudoacacia*), and two fragments of sweetgum. The cobbles constituting Feature 4 were obviously brought to this location by the prehistoric inhabitants, and two of them exhibit clear evidence of heating. Despite this evidence of a cultural origin of the feature, it is impossible to determine whether the feature represents an *in situ* hearth remnant, a deposit of boiling stones, or an aggregation of secondary refuse.

Artifacts

The prehistoric artifact assemblage contains 130 items: 95 ceramic sherds, 18 pieces of chipped stone, a possible hammerstone, and 16 pieces of fire-cracked rock. An additional 17 unmodified cobbles or pebbles are not included in this total but are believed to derive from the prehistoric occupations.

Ceramics. The 95 ceramic sherds make up 73.1 percent of the prehistoric artifacts and are the only temporally diagnostic items in the assemblage. The distribution of the ceramics by surface treatment and temper is shown in Table 3. The only clearly identifiable surface treatment is cord marking, which accounts for 62.1 percent of the total. An additional 36.8 percent of the sherds have indeterminate or eroded surfaces, and a single sherd appears to be plain. One cord-marked sherd exhibits what is apparently the impression of a grass stem or reed.

At least four vessels are represented in the assemblage. Vessel 1 is represented by at least 78 sherds, including 88.6 percent of the 88 sherds found in undisturbed contexts. That vessel is a relatively thick (ca. 6.5–

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Table 3. Distribution of Prehistoric Ceramics by Temper and Surface Treatment.

Surface Treatment	Fine Sand	Temper Sand/Grit	Grit	Total
Cord marked	42	17	0	59
Plain (?)	0	1	0	1
Indeterminate	22	4	9	35
Total	64	22	9	95

8.2 mm), conical or sub-conical jar that is tempered with fine sand and occasional particles of quartz grit measuring up to 3 mm in diameter (Figure 7). Sherds from that vessel have been classified as both sand tempered and sand and grit tempered in Table 3. The rim diameter is unknown, but the upper body diameter appears to have been at least 23 cm. Coil breaks are extremely common and are present on essentially all of the sherds over 1.5 cm in size. The predominant surface (and core) color varies from light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6); a few sherds exhibit dark grayish brown (10YR 4/3) exteriors. The vessel is cord marked. The upper part of the body exhibits cord marking at about a 45-degree angle to the presumed rim; the lower body exhibits overlapping cord marking that generally appears to be parallel to the rim and may have been partially smoothed. When it can be determined, the cord appears to be S-twist. Only a single, possible rim sherd is present; it exhibits what appears to be a looped, heavy cord impression. The surface treatment, temper, and form of this vessel suggest that it is Early Woodland in age and can be assigned to the Badin Cord-Marked type defined by Coe (1964:27).

The 17 sherds that cannot be assigned to Vessel 1 come from both undisturbed contexts in Stratigraphic Unit 1 and disturbed contexts in Units 2 and 4. The 10 unassigned sherds from undisturbed contexts are extremely small sand-, sand/grit-, and grit-tempered sherds, and include only one specimen weighing over 2.5 g. Most of these specimens are likely fragments of Vessel 1; only two sherds, both from the intact A horizon west of the Vessel 1 distribution, appear to derive from a different vessel or vessels. One of those sherds apparently has a plain surface. Due to their small size, these two sherds have not been assigned to specific vessels.

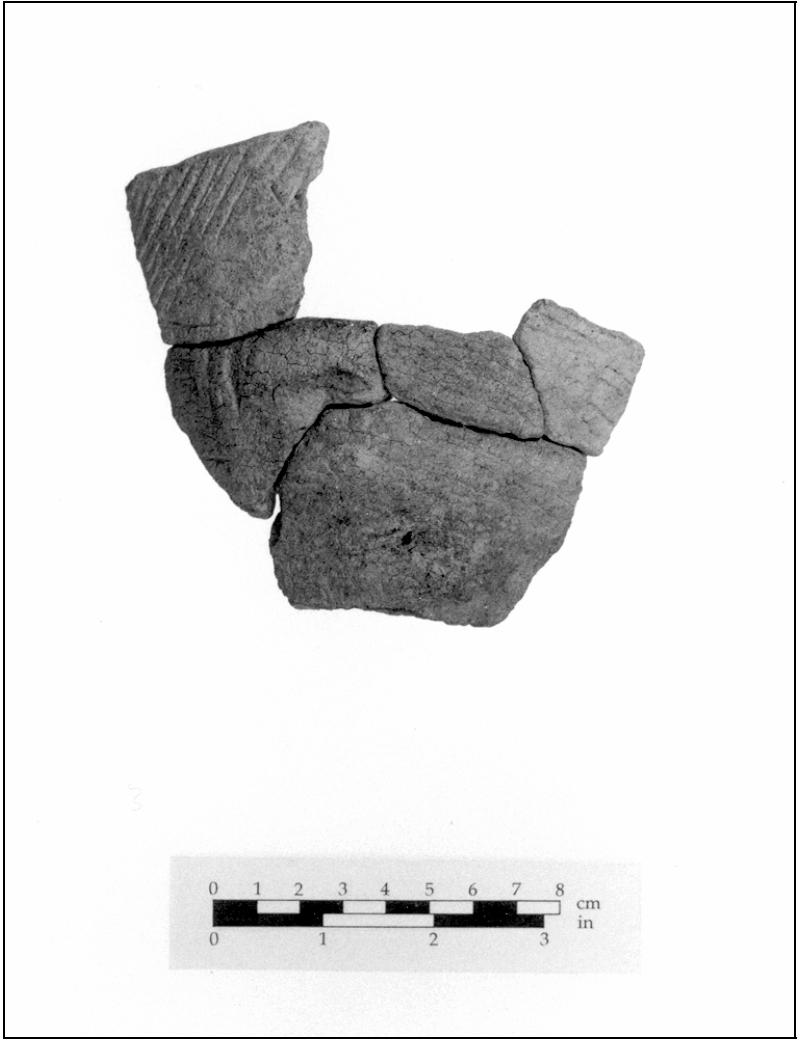


Figure 7. Reconstructed fragment of a Badin Cord-Marked vessel (Vessel 1).

The seven sherds from disturbed contexts represent at least three additional vessels. Vessel 2 is represented by a single small sand- and grit-tempered rim sherd from the plow zone. The rim form is uncertain but may be everted. The exterior exhibits traces of unidentified surface treatment, and the interior has been scraped. A second small rim, also from the plow zone, is similar to the sherd from Vessel 2 but cannot be

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assigned to that vessel. Vessel 3 is represented by a single, 9.4-cm thick body sherd that was recovered from Stratigraphic Unit 2. This sherd exhibits near-vertical S-twist cord marking. Vessel 4 is represented by a single grit-tempered body sherd with a distinctive, light red (10R 6/8) outer surface. It is 8.6 mm thick, weighs 7.8 g, exhibits unidentified surface treatment, and was recovered from the lowest plow zone. The four remaining sherds are grit-tempered or sand- and grit-tempered with indeterminate surface treatments and cannot be assigned to specific vessels.

In summary, most of the sherds from undisturbed contexts represent fragments of a single Early Woodland period Badin Cord-Marked vessel. Only two sherds from undisturbed contexts are unlikely to be associated with that vessel; conversely, no Vessel 1 sherds were recovered from disturbed contexts. The sherds from undisturbed contexts represent at least three, and probably more, additional vessels. None of these sherds are temporally diagnostic.

Chipped Stone. The chipped stone assemblage consists of only 18 artifacts; of those, only four (22.2 percent of the total) were found in stratigraphic association with Vessel 1. All four of those artifacts are of quartzite. The first is a large quartzite core that appears to have been used as a scraper. The remaining three artifacts include a second core (a stream cobble with several flakes removed) and two flakes.

Fourteen pieces of chipped stone were recovered from the plow zones. One of those artifacts (found during the initial shovel testing) is a quartzite flake fragment that was possibly used as a scraper. The rest of the assemblage is composed of unmodified debitage, including seven pieces of rhyolite and six pieces of quartz.

Possible Hammerstone. A single possible hammerstone was recovered from one of the plow zones. This is an oblong cobble of quartzite or quartz sandstone that exhibits possible battering on one end.

Fire-Cracked Rock. Sixteen pieces of fire-cracked rock were recovered. Ten fragments came from undisturbed contexts associated with Vessel 1, including two fragments from Feature 4. All of those specimens are fragments of quartzite river cobbles. Two additional quartzite fragments were recovered from shovel tests into Stratigraphic Unit 1b and likely predate the Early Woodland occupation. Three fragments, two of quartzite and one of amphibolite, were found in Stratigraphic Unit 2, the cut and fill deposit. A final quartzite fragment was recovered from the plow zone.

Other Lithic Artifacts. Seventeen apparently unmodified quartzite

river cobbles were recovered from Stratigraphic Unit 1b, including nine specimens from test units near Vessel 1. These artifacts are believed to derive from the prehistoric occupation, but there is no direct evidence of their use.

Archaeobotanical Remains

Limited archaeobotanical remains were recovered from hand-picked and flotation samples taken from both undisturbed and disturbed (plow zone) contexts. The results of the analyses of these materials are presented by stratigraphic association in Table 4.

Taken together, the samples provide only limited insights into the paleo-environment of the site and the surrounding region. At the time of the Early Woodland occupation, the site apparently supported a floodplain forest containing such species as hickory, oak, sweetgum, black locust, black gum, and tulip poplar. Grape was present as an understory species. The dramatic changes in forest cover resulting from historic-period land-use patterns are visible in the sample from the plow zone, which was composed almost totally of species (chestnut, pine, cherry, and willow) that were not found in the earlier samples. Unfortunately, the data provide little information concerning the diet of the Early Woodland occupants. Like virtually all populations in the Eastern Woodlands, the occupants of this site seem to have eaten hickory nuts and wild grapes. Black gum seeds are also edible, but the tulip poplar seeds are unlikely to represent food remains.

Chronology

The only temporally diagnostic prehistoric artifacts recovered consist of the fragments of Vessel 1, which has been assigned to the Early Woodland Badin Cord-Marked type based on its form, surface treatment, and temper. The remaining ceramic sherds, which include two rims, are not clearly diagnostic. None of the lithic artifacts is diagnostic, although the presence of quartzite cores and debitage is generally compatible with an Early Woodland occupation.

As discussed above, two radiocarbon dates were obtained from 31De169. The first (Beta-76119), from Stratigraphic Unit 2, was obtained on a single fragment of carbonized oak wood. The C-13 adjusted age of 250 ± 60 B.P. translates to a calendar date of A.D. 1700 ± 60 and a two-sigma range of A.D. 1580–1820. When calibrated

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Table 4. Archaeobotanical Remains from 31De169.

Stratigraphic Context		Unit IV	Unit II	Unit Ib										Unit 0		
Horizon	Plowzone	Cut/Fill	Ab	Ab	Ab	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Fea.4	C
Location	TU2-L1	N200E192	TU2-L6	TU2-L6	TU6-L1	N199E170	TU2-L9	N199E175	Fea.2	Fea.2	Fea.2	Fea.3	Fea.3	Fea.3	Fea.4	Auger 5
Bag Number	25	43	29	30	23	42	52	67	20	22	37	38	40	61		
Recovery Technique	HP	HP	HP	Float	Float	HP	HP	Float	Float	HP	HP	Float	Float	HP	Float	HP
Composition																
Wood	6.2	9.4	0.7	4.5	3.5	-	0.4	1.0	4.7	0.1	3.8	12.4	5.3	0.1		
Nutshell (Hickory)	-	-	-	-	<0.1	-	-	0.3	-	-	-	-	<0.1	-		
Bark	-	-	-	-	-	5.0	-	-	-	10.0	-	-	-	0.4		
Residual	-	-	-	12.7	16.5	-	-	7.0	8.6	-	28.6	2.0	-	-		
Total	6.2	9.4	0.7	17.2	20.1	5.0	0.4	8.3	13.3	10.1	3.8	41.0	7.4	0.5		
Seed Identifications																
<i>Liriodendron tulipifera</i>	-	-	-	-	3	-	-	-	-	-	-	-	-	-		
(tulip poplar)																
<i>Nyssa</i> sp. (black gum)	-	-	-	-	3	-	-	-	-	-	-	-	-	-		
<i>Vitis</i> sp. (grape)	-	-	-	-	2	-	-	-	-	-	-	-	-	-		
Total	0	0	0	0	8	0	0	0	0	0	0	0	0	0		
Wood Identifications																
<i>Carya</i> spp. (hickory)	-	-	-	11	-	-	-	-	14	1	-	-	-	-		
<i>Castanea dentata</i>	5	-	-	-	-	-	-	-	-	-	-	-	-	-		
(chestnut)																

Table 4 Continued.

Stratigraphic Context		Unit IV	Unit II	Unit Ib										Unit 0	
Horizon	Plowzone	Cut/Fill	Ab	Ab	Ab	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	C
Location	TU2-L1	N200E192	TU2-L6	TU2-L6	TU6-L1	N199E170	TU2-L9	N199E175	Fea.2	Fea.2	Fea.3	Fea.3	Fea.4	Auger 5	
Bag Number	25	43	29	30	23	42	52	67	20	22	37	38	40	61	
Recovery Technique	HP	HP	HP	Float	Float	HP	HP	Float	Float	HP	HP	Float	Float	HP	
Wood Identifications (continued)															
<i>Liquidamber styraciflua</i> (sweetgum)	-	-	-	-	-	-	3	4	-	-	25	28	2	-	
<i>Pinus</i> sp. (pine)	17	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Platanus occidentalis</i> (sycamore)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
<i>Prunus</i> sp. (cherry)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Quercus</i> spp. (oak)	4	30	4	19	24	-	-	8	5	-	-	2	25	-	
<i>Robinia pseudoacacia</i> (black locust)	-	-	-	-	6	-	-	5	-	-	-	-	3	-	
<i>Salix</i> sp. (willow)	3	-	-	-	-	-	-	-	-	-	-	-	-	-	
Unid. diffuse porous	-	-	1	-	-	-	-	-	1	-	-	-	-	-	
Unid. Bark	-	-	-	-	-	-	-	-	10	-	-	-	-	-	
Unidentified	-	-	-	-	-	-	-	13	-	-	-	-	-	-	
Total	30	30	5	30	30	0	3	30	30	1	25	30	30	1	

HP - Hand picked.

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(Stuiver and Reimer 1993), this date has an intercept of A.D. 1660 and a two-sigma range of A.D. 1486–1954. The second date (Beta-77252) was obtained on carbonized sweetgum wood from Feature 3 and apparently represents the burned stump or roots of a tree that was roughly contemporaneous with the Early Woodland occupation. The C-13 adjusted age of $2,090 \pm 70$ B.P. translates to a calendar date of 140 ± 70 B.C. and a two-sigma range of 280–0 B.C., and provides an age for the Early Woodland occupation that produced Vessel 1. When calibrated (Stuiver and Reimer 1993), this date has intercepts of 90 and 70 B.C. and a two-sigma range of 357 B.C.–A.D. 72.

In a further attempt to gather chronological information, two Oxidizable Carbon Ratio (OCR) dates (Frink 1992, 1994) were obtained on charcoal from Unit 1b. Both OCR determinations were made by the Archaeological Consulting Team (ACT) of Essex Junction, Vermont, under the direction of Douglas Frink. The first date (ACT Lab Number 1237) is derived on a sediment sample from the uppermost part of the Bt horizon in Stratigraphic Unit 1b and is stratigraphically comparable with the earlier radiocarbon date. The OCR assay produced a date of $3,248 \pm 97$ B.P., which converts to a calendar date of $1,298 \pm 97$ B.C. and a two-sigma range of 1,492–1,104 B.C. The apparent discrepancy between it and the radiocarbon date can be explained by the nature of the charcoal dated by the OCR technique, which consisted of small fragments and likely represented charred wood from a variety of sources. Since the sediments are alluvial in nature, it is likely that some or most of this charcoal was reworked material that was likely considerably older than the strata itself.

The second OCR date (ACT Lab Number 1236) is derived from a sediment sample from the buried A horizon. The OCR assay produced a date of 995 ± 30 B.P., which converts to a calendar date of A.D. 955 ± 30 and a two-sigma range of A.D. 895–1015. Like the other date, this assay dates the mean age of the charcoal present in the sediments and not necessarily the age of deposition or last exposure of the sediment itself. Based on other evidence, it seems likely that the A horizon formed sometime after A.D. 1 and was an exposed surface as recently as the early historic period.

Summary of the Prehistoric Component

In summary, the primary prehistoric occupation of 31De169 is evidenced by a moderate density artifact scatter located in the upper

30–40 cm of a buried land surface, designated Stratigraphic Unit 1b. The component is severely restricted both horizontally and vertically, and is limited to a strip about 6 m wide along the backslope of a natural levee. It is likely that the occupation once extended east onto the top of this levee, but that deposits in that area have been largely destroyed by plowing and erosion in that area.

The Early Woodland artifact assemblage is dominated by ceramics, including at least 78 sherds from a single Badin Cord-Marked vessel. The associated lithic assemblage is very meager and consists of two quartzite cores, two quartzite flakes, fire-cracked rock fragments, and apparently unmodified cobbles. The unplowed Early Woodland deposits contain archaeobotanical remains as well as artifacts, and probably represent refuse that was discarded on the backslope of the levee. The artifacts in this deposit appear to be in their original contexts, and any features located in the area would likewise be undisturbed. Any associated deposits once located on the higher part of the levee to the east have probably been plowed away, but any features present in that location would likely be at least partially preserved.

Regional Comparisons

Previous studies of the Early Woodland period in the North Carolina Piedmont have been restricted by the limited data available. Only a small number of Early Woodland sites have been investigated, and little subsistence or settlement information is available (Davis 1987:7). The limited investigation of 31De169 adds only slightly to our knowledge concerning the period, but does provide some chronological information.

In particular, the 31De169 investigations provide what is apparently the first radiocarbon date associated with Badin ceramics in the Carolina Piedmont. As discussed above, that date was obtained on a charred sweetgum stump in stratigraphic association with a broken Badin vessel and produced an adjusted two-sigma range of 280–0 B.C. and a calibrated two-sigma range of 357 B.C.–A.D. 72. This date is comparable to three of four dates previously reported on Yadkin ceramics, which are generally believed to postdate Badin ceramics in the Piedmont sequence (Table 5). Those four dates come from three sites in Chatham and Forsyth counties, North Carolina, and in Sumter County, South Carolina, and produced calibrated intercepts ranging from 393 B.C. to 165 B.C. (Eastman 1994).

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Table 5. Radiocarbon Dates for Badin and Yadkin Ceramics.

Sample No.	Site	Calibrated Intercept	Calibrated Two-Sigma Range	Ceramic Associations
Beta-1357	31Ch8	199 B.C.	405 B.C.–A.D. 20	Yadkin Cord Marked Yadkin Fabric Impressed
Beta-32665	31Fy549	193 B.C.	396 B.C.–A.D. 14	Yadkin Fabric Impressed
Beta-17859	31Su83	165 B.C.	379 B.C.–A.D. 56	Yadkin Fine Cord Marked
Beta-14594	31Su83	393 B.C.	762–186 B.C.	Yadkin Check Stamped Yadkin Simple Stamped
Beta-77252	31De169	75 B.C.	355–290 B.C. 230 B.C.–A.D. 70	Badin Cord Marked

The calibrated two-sigma range for the 31De169 date overlaps the ranges of all four dates and is essentially contemporaneous with three of the dates. The internal consistency among the four Yadkin dates suggests that they are reliable and that Yadkin ceramics were made as early as the first few centuries B.C. (Eastman 1994:26–27). The significance of the overlap between the 31De169 date on Badin ceramics and the four dates on Yadkin materials is difficult to resolve with the available data. The overlap between the dates may be merely the result of a less than perfect association between the Early Woodland deposits and the dated sweetgum stump at 31De169, which might actually predate the Badin occupation. Alternatively, it may indicate the existence of considerable ceramic variability during the Early Woodland in this area and perhaps the lack of a neatly linear, developmental relationship between Badin and Yadkin ceramics. As the four sites that produced the dates are located in three different drainages and are up to 240 km apart, it is possible that the ceramic change proceeded at different rates in various parts of the region.

At present, it is impossible to determine the role of 31De169 within the Early Woodland settlement system. The excavated deposits may relate to a small, short-term occupation, but might also represent the southern end of a larger site centered to the north on the higher part of the levee. Given the previously documented scarcity of Early Woodland sites in the Yadkin drainage, it might be argued that this site does not represent an extensive occupation, but that assessment cannot be demonstrated with the available evidence.

**Floodplain Geomorphology, Site Preservation,
and Site Discovery**

In addition to the archaeological data, the investigations at site 31De169 provided information relating to two topics concerning floodplain geomorphology and archaeological sites. The first involves the processes responsible for site burial and preservation in riverine contexts; the second relates to the suitability of various archaeological survey techniques in locating and assessing buried deposits.

Geomorphology and Site Preservation at 31De169

As is the case in most compliance studies, the location of the present work was dictated by development plans and not chosen as a test of the chokes/coves site location model discussed above (Gunn 1991, 1993). Despite this caveat, however, it is useful to evaluate the geographical position of 31De169 in relation to the model.

Site 31De169 is located on a levee ridge in the Yadkin River floodplain, at a point where the valley is about 260 m wide. The river channel is about 100 m wide and is situated against the eastern edge of the valley. Most, if not all, of the levee deposits were formed when the river was in approximately its present position, to the east of the site. The levee extends at least 700 m (and probably much farther) to the north; at a point about 100 m north of 31De169, the top of the buried surface is approximately 1.7 m higher than at the site, and the present levee surface is about 1.9 m higher than at the site.

The site is situated at the southern end of a roughly 1-km long area in which the river valley ranges from about 260 to 400 m wide and is slightly narrower than it is above and below the reach. For a 1.5-km segment above the reach the valley ranges from 450 to 750 m in width; in the 1-km segment below the site the valley is from 450 to 600 m wide. While the site lies about 1 km downstream from a slight constriction of the river valley that might be interpreted as a choke, the floodplain at the site location is not appreciably wider than it is at the constriction upstream. The presence of a levee running almost the entire length of the 1-km reach of narrow floodplain suggests that despite the relative narrowness of the floodplain, the river still has sufficient room to spread out and drop its sediment load. Consequently, it appears that this segment of river does not qualify as a true narrows and that the relative

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constriction upstream is best not considered a true choke.

It appears that 31De169 is located in a segment of floodplain that lacks the characteristics associated with extensive sedimentation and high probability for site burial, and in fact the site lacks the highly stratified contexts identified at the Doerschuk site (Coe 1964) and the Haw River sites (Claggett and Cable 1982). Instead, 31De169 is situated in a relatively narrow, nondistinctive segment of floodplain that is nonetheless wide enough to permit levee formation and the stability of parts of that levee over a several-thousand-year period. Human populations occupied the levee surface on at least two occasions during its formation, and the continued accumulation of sediment acted to preserve the record of those occupations.

The presence of buried deposits at 31De169 does not diminish the validity of the cove/choke model or its usefulness in predicting locations that are likely to have substantial, stratified deposits. It does, however, demonstrate that prehistoric surfaces containing significant cultural deposits, albeit deposits less intensively stratified than those at the Doerschuk and Haw River sites, may be preserved in less immediately recognizable situations than those outlined by the model.

Site Discovery in Floodplain Environments

A review of the present project provides insight into the efficacy of various techniques of locating and evaluating archaeological sites in floodplain deposits. Since a backhoe could not be used during the initial survey due to lack of landowner permission, a combination of hand-dug shovel tests and trenches was used to search for buried deposits. The shovel tests were successful in locating historic artifacts within one of the buried plow zones and in determining the spatial extent of those artifacts, and were also successful in demonstrating the general absence of prehistoric artifacts in the upper 1 m of deposits. As expected, however, they did not provide information on more deeply buried deposits. In fact, subsequent investigation revealed that none of the six shovel tests placed between the river and the stream succeeded in penetrating through the historical alluvium.

The hand-dug trenches succeeded in identifying the buried prehistoric deposit at 31De169 and must be regarded as effective, but they provided only limited information on the stratigraphic context of the prehistoric materials. For example, two of the three trenches were placed totally within the historic period sediments (Stratigraphic Units 2, 3, and 4) and

did not encounter the buried surface of Unit 1b.

Ironically, the interpretation of the stratigraphic context was not greatly aided by the discovery of cultural remains in Trench C. That trench encountered what was believed to be a cultural feature in association with prehistoric ceramics. Subsequent work indicated that this short unit succeeded in locating three distinct phenomena within a 2-m area: the eastern edge of the intact Ap horizon, the densest part of the prehistoric artifact distribution, and a stained area (Feature 1) that subsequently proved to be a burned tree stump. This complex situation was essentially impossible to interpret in the confines of the 2-x-0.75-m trench, especially since the buried A and Bt horizons that contained artifacts had not been encountered in any of the other trenches. Fortunately, and despite the uncertainty regarding the precise contexts of the prehistoric artifacts, the recovered deposits were more than adequate to demonstrate that additional work was warranted.

The backhoe trenches and accompanying geomorphological investigations provided much additional information concerning the context of the deposits at 31De169. The exposures made it possible to characterize and determine the extent of the stratigraphic units, as well as to evaluate the distribution of the prehistoric artifacts and the nature of the possible feature observed in hand-dug Trench C during the survey work. The backhoe was also useful in removing sufficient overburden to allow hand excavation of a suitable sample of the undisturbed sediments.

Summary

Two principal conclusions concerning site preservation and discovery can be drawn from the survey and testing at 31De169. Both statements have been said before in various contexts, but they bear repeating.

First, archaeological sites can be preserved in a variety of floodplain situations. Slackwater basins and eddies downstream from narrows provide the best contexts for sediment accumulation and the creation and preservation of extensively stratified sites (Gunn 1991, 1993), but significant sites can also be preserved in less obvious situations. For example, intact prehistoric landforms are present beneath historic alluvium in the project area, despite considerable lateral migration of the river. It should also be noted that there is evidence for considerable variation in alluvial conditions within a relatively restricted area of floodplain. The deposits encountered by the present project are

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considerably different from the highly stratified deposits found by Stanley South less than 400 m to the north.

Second, surveys in floodplains must take into account the likely presence of extensive deposits of historical alluvium as well as the potential for stratified prehistoric deposits. Field methods must be designed to penetrate beneath the historic alluvium and systematically sample the underlying deposits. The testing must search for buried surfaces as well as artifacts and should include sufficient lateral exposures to determine the nature and extent of those deposits. Backhoe trenching is undoubtedly the best way to look for buried surfaces or deposits, but intensive deep shovel and/or auger tests, if combined with hand-dug trenches, can provide adequate data if backhoe testing is impossible. The excavation of traditional shallow shovel tests is rarely, if ever, an adequate survey technique in floodplains.

Conclusions

The investigations at the Yadkin River pipeline crossing documented the presence of an intact Early Woodland component buried beneath up to 1.6 m of floodplain sediments, and provided what is apparently the first radiocarbon date associated with Badin Cord-Marked ceramics. As the pipeline was placed within the backhoe trench excavated during site testing, no additional excavations will be conducted at the site as part of the present project. Most of site 31De169 probably remains buried within the floodplain, however, and can potentially provide additional data concerning the Early Woodland occupation of the North Carolina Piedmont.

In addition to the archaeological evidence, the project also provided considerable data concerning the floodplain geomorphology and the extent of historic-period alluviation in the project area. The results also demonstrate that archaeological remains can be preserved in a variety of alluvial settings, and further document the role of intensive deep testing in identifying sites in floodplain environments.

Acknowledgments and Curation

The investigations at 31De169 were conducted in July and August, 1994, by Garrow & Associates, Inc., under contract to Piedmont Natural Gas (PNG) of Charlotte, North Carolina. This paper is largely based on a compliance report documenting the project

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(Webb 1995), which is on file at the Office of State Archaeology in Raleigh. Previous versions of this paper were reviewed by Dan Cassedy, Patrick Garrow, Joel Gunn, and Jerry Lilly, who are absolved of any responsibility for the interpretations expressed herein.

At the request of the landowner, all recovered artifacts were returned to him at the completion of the analysis. Copies of the field and analysis forms, photographs, and videotape documenting the investigations are on file at the Garrow office in Raleigh.

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BIOARCHAEOLOGICAL ANALYSIS OF THE MORTUARY PRACTICES AT THE BROAD REACH SITE (31CR218), COASTAL NORTH CAROLINA

**by
Elizabeth I. Monahan**

Abstract

The Broad Reach site (31Cr218) is a Middle Woodland and Late Woodland burial and habitation site in Carteret County, North Carolina. Excavation of the site in 1991 and 1992 uncovered numerous archaeological features, including a wide variety of burial types. Burials included two kinds of ossuaries, single interments, and one double interment. One of the ossuaries, Burial 6, contained 10 bundled individuals (nine adults and one infant) and an assortment of funerary objects. This type of burial is previously unknown on the coastal plain. Mathis (1993) has suggested that Burial 6 may be an elite burial. This proposition was evaluated through two related information sources: the cultural and the biological remains of the mortuary practices. Cultural artifacts of the burial process include burial type, position, funerary objects, and body treatment prior to final interment. Biological data of health and nutrition were obtained from the human skeletal remains. Although the analysis of the cultural features supports the idea that Burial 6 was a status interment, the outcome of the skeletal analysis was ambiguous. A model proposing that Burial 6 was the result of both status differentiation and diachronic change is outlined, and avenues for future research to address the question of status differentiation are suggested.

The Broad Reach site, located in Carteret County, North Carolina, was first surveyed in 1987 as part of a cultural resources survey for a proposed marina. It was defined by a concentration of marine shell that extended approximately 600 m along the shore of Bogue Sound near Sander's Bay and about 200 m inland (Martin and Drucker 1987) (see Figure 1). At the time, the North Carolina Office of State Archaeology (OSA) was becoming increasingly concerned about procedures commonly used in archaeological surveys on the North Carolina coast. Some of the specific concerns were: "(1) the overall efficacy and focus of shell midden survey and evaluation projects; (2) the tendency to define site boundaries, and specifically 'core' areas, based on the distribution of shell, shell midden, or even the density of the surface artifacts; and (3) the subsequent focus of (impact) mitigation or research excavation

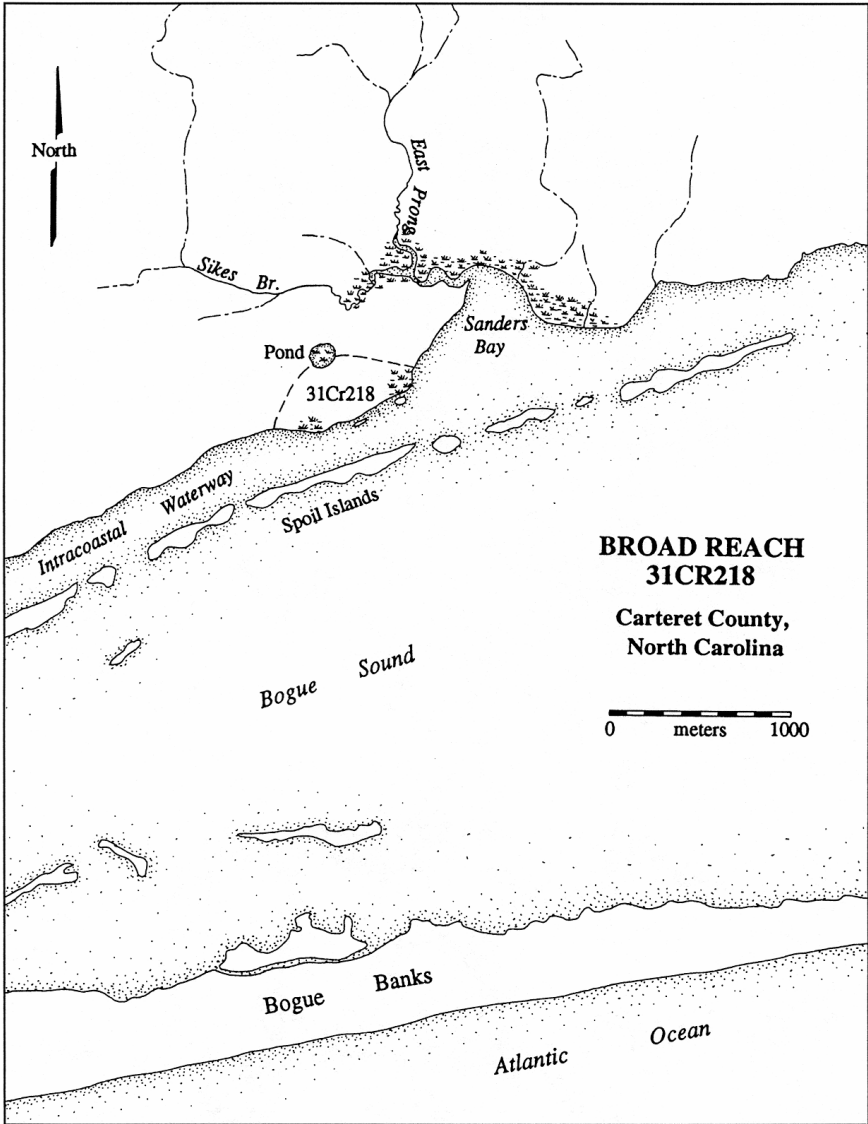


Figure 1. Location of the Broad Reach site (from Mathis 1993). Used with permission of the National Park Service.

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activities on the 'core' areas" (Mathis 1992:4). The discovery of habitation areas and human burials at Broad Reach, at a distance from the shell concentrations, supported the idea that "the peripheries of the sites may be more important than previously thought" (Mathis 1992). Because impact mitigation surveys are often the basis for decisions concerning the destruction, excavation, or preservation of a site, it is important that such surveys accurately predict the site boundaries and significance.

To test the efficacy of site-assessment methods commonly employed in surveys, the Broad Reach Archaeological Project was started in May 1991 under the direction of Mark Mathis. Archaeological features at the site were exposed by mechanically stripping the plowzone from approximately three hectares within the marina project area. Two seasons of excavation (1991 and 1992) led to the discovery of numerous archaeological features, including shell-filled pits, postmold-like stains, midden scatters, burned surfaces, refuse pits, and human burial pits (Mathis 1993). The most common features excavated were shell-filled pits. All or portions of 11 oval, round, and rectangular structure patterns were excavated. One structure appears to have been a true long house measuring 6 m across and over 17 m long (the end of the structure extended beyond the area excavated) (Mathis 1993). As a result of this project, Broad Reach is presently one of the most extensively excavated coastal plain sites (Figure 2).

Nine radiocarbon dates were obtained from both features and burials, indicating an occupation beginning as early as A.D. 445 and ending as late as A.D. 1444 (Eastman 1994) (see Table 1). The site was probably occupied permanently at different times, with intervening periods of abandonment.

Description of Burials

A minimum of 31 individuals are represented by the burials at Broad Reach. They are described here according to cemetery area (see Figure 3 and Table 2). Complete skeletal inventories and descriptions of pathology and anomalies, and an explicit explanation of aging and sexing methods, are presented elsewhere (see Monahan 1994).

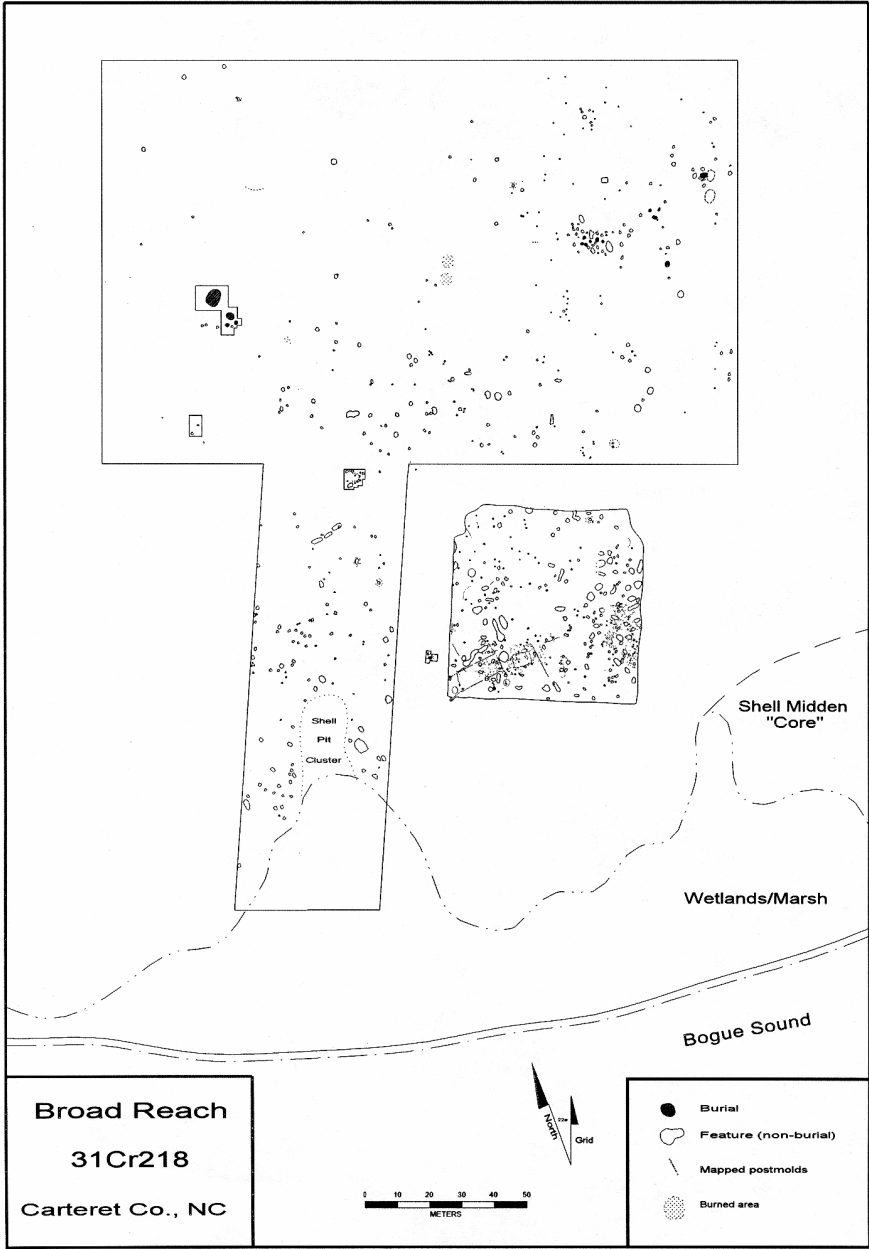


Figure 2. Plan view of the Broad Reach site excavations.

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Table 1. Radiocarbon-Dated Contexts at the Broad Reach Site (from Eastman 1994).

Radiocarbon Assay Context	(Years B.P.)	Calibrated Intercept	One-Sigma Range	Laboratory Number
Burial 6	670±80	A.D. 1168	A.D. 1032–1247	Beta-53075
Burial 8	1420±90	A.D. 445	A.D. 389–601	Beta-58941
Burial 13	1020±90	A.D. 888	A.D. 775–997	Beta-58942
Burial 16	410±70	A.D. 1398	A.D. 1295–1433	Beta-58943
Feature 118	610±50	A.D. 1398	A.D. 1307–1411	Beta-58944
Feature 191	480±50	A.D. 1449	A.D. 1435–1483	Beta-52529
Feature 434	730±70	A.D. 1290	A.D. 1273–1379	Beta-58945
Feature 490	570±50	A.D. 1415	A.D. 1400–1436	Beta-58946
Feature 590	500±50	A.D. 1444	A.D. 1430–1273	Beta-58947

Cemetery Area 1

These five burials were close to Cemetery Area 2 on the northeast side of the excavation.

Burial 3 was a partial bundle with the head to the north, facing west. A cluster of oyster and clam shells and three shark teeth were associated with the burial. The individual is a female aged 30–40 years at death.

Burial 4 contained only a few, poorly preserved, human skeletal fragments. There were no associated artifacts, and age and sex could not be determined. It is possible that the majority of the remains were disinterred at some point in the past and relocated elsewhere, perhaps to an ossuary (Mathis 1992).

Burial 5 was a tightly flexed burial or a partially articulated individual, with the head to the northwest and facing southwest. A whole clam shell was found near the skull. The individual is a female who was over 45 years of age at death.

Burial 7 is another burial which may have been disturbed in the past. There were few skeletal remains in the burial and they were poorly preserved. Portions of a dog skeleton were found beneath the human remains. This individual was aged 6–8 years old at death.

Burial 13 was a flexed individual with the head to the north and was positioned on its right side with the hands beneath the cranium. Bone from this individual was radiocarbon dated to 1020±90 B.P. (cal A.D. 888). A green hammerstone, deer antler, deer bone, and seven shark teeth were associated with this burial. The individual was a male aged 25–35 years at death.

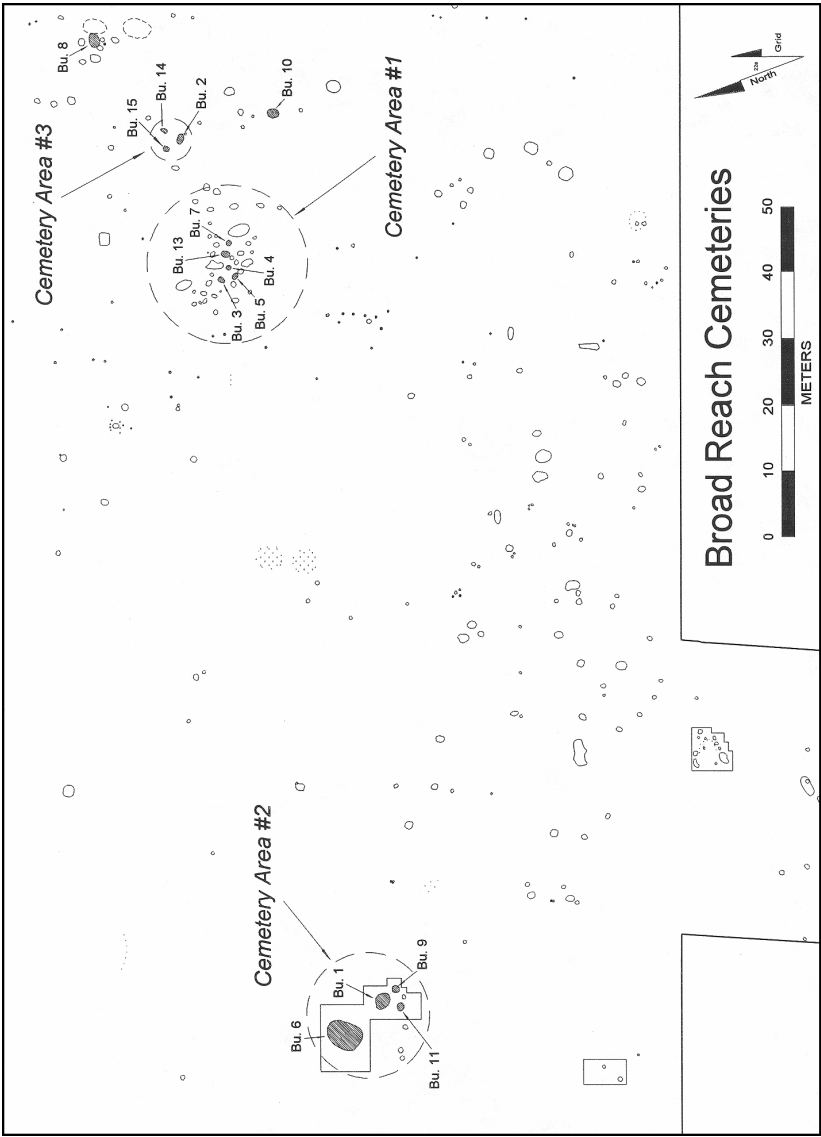


Figure 3. Close-up of the Broad Reach site plan showing burials (excluding Burial 16) and cemetery areas.

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Table 2. Summary of Burials at the Broad Reach Site by Cemetery Area.

Context	Age	Sex	Funerary Object(s)
Cemetery Area #1			
Burial 3	24–30 years	Female	3 shark teeth
Burial 4	undetermined	undetermined	-
Burial 5	45+ years	Female	whole clam
Burial 7	6–8 years	undetermined	dog skeleton
Burial 13	25–35 years	Male	7 shark teeth, green hammerstone, deer bone, deer antler tip
Cemetery Area #2			
Burial 1A (ossuary)	4–6 years	undetermined	8 copper beads
Burial 1B (ossuary)	5–7 years	undetermined	scattered over
Burial 1C (ossuary)	30–45 years	undetermined	pit contents
Burial 1D (ossuary)	30–45 years	undetermined	-
Burial 6 Bundle 1A	35–45 years	Female	turtle shell, cut shell disc beads, green chlorite schist "cup", White Oak pot
Burial 6 Bundle 1B	3–6 months	undetermined	-
Burial 6 Bundle 2A	24–30 years	Male	-
Burial 6 Bundle 2B	16–18 years	Female	-
Burial 6 Bundle 3A	18–24 years	Male	<i>Marginella</i> shell bead cape or cloth
Burial 6 Bundle 3B-1	18–25 years	Male	-
Burial 6 Bundle 3B-2	Adult	undetermined	-
Burial 6 Bundle 4	24–30 years	Male	-
Burial 6 Bundle 5A	30–35 years	Female	-
Burial 6 Bundle 5B	Adult	undetermined	-
Burial 6 Bundle 5C	Adult	undetermined	-
Burial 6 Bundle 5D	1–3 years	undetermined	-
Burial 6 Bundle 5E	6–10 years	undetermined	-
Burial 6 Bundle 5F	4–7 years	undetermined	-
Burial 6 Bundle 6	20–24 years	Female	-
Burial 6 Bundle 7	35–40 years	Male	-
Cemetery Area #3			
Burial 2	8–12 years	undetermined	cobble
Burial 14	Adult	undetermined	whelk shell
Burial 15	35–40 years	Female	-

Table 2 Continued.

Context	Age	Sex	Funerary Object(s)
Burials Outside Cemetery Areas			
Burial 8	45+ years	Female	2 Hanover pots, 8 turtle shells, deer antler and bone, beaver tooth, <i>conus</i> shell
Burial 8A	40+ years	Female	-
Burial 10	40+ years	Female	turtle shell
Burial 16	40–50 years	Female	-

Cemetery Area 2

This group of burials is located near the west side of the excavated area. No other burials were found in the vicinity.

Burial 1 was a small, shallow, round ossuary pit. The skeletal remains were disarticulated and scattered, and a small amount of charred bone was found in one section of the pit. Eight copper beads were found over the bones. Given the number of crania visible during excavation, it is likely that six individuals were represented (Mathis 1992); however, based on the teeth, only four individuals could be discerned in the lab. The skeletal remains are in very poor condition and were damaged by plowing. There are at least two adults aged 30–45 years at death, and two subadults, aged 4–5 years and 5–6 years at death. It was not possible to determine the sex of the individuals.

Burial 6 also was an ossuary, but it was in a much larger and deeper pit than Burial 1 (see Figure 4). This pit measured 5 m by 3.5 m, and extended 0.7 m below the plowzone (Mathis 1992). The remains were covered with a thick layer of clam shells. Bone from Burial 6 was radiocarbon dated to 670±80 B.P.(cal A.D. 1168), confirming the Late Woodland association of the burial. There were 10 bundles in the pit, labeled Bundles 1A, 1B, 2A, 2B, 3A, 3B, 4, 5, 6, and 7. Bundles 3B and 5 each contained elements of more than one individual; however, each bundle appears to represent virtually all elements of a single individual. The skeletal remains were arranged in two groups of two and two groups of three overlapping bundles. Bundle 1A is a female aged 35–45 years at death. Bundle 1B is an infant aged 3–6 months. Bundle

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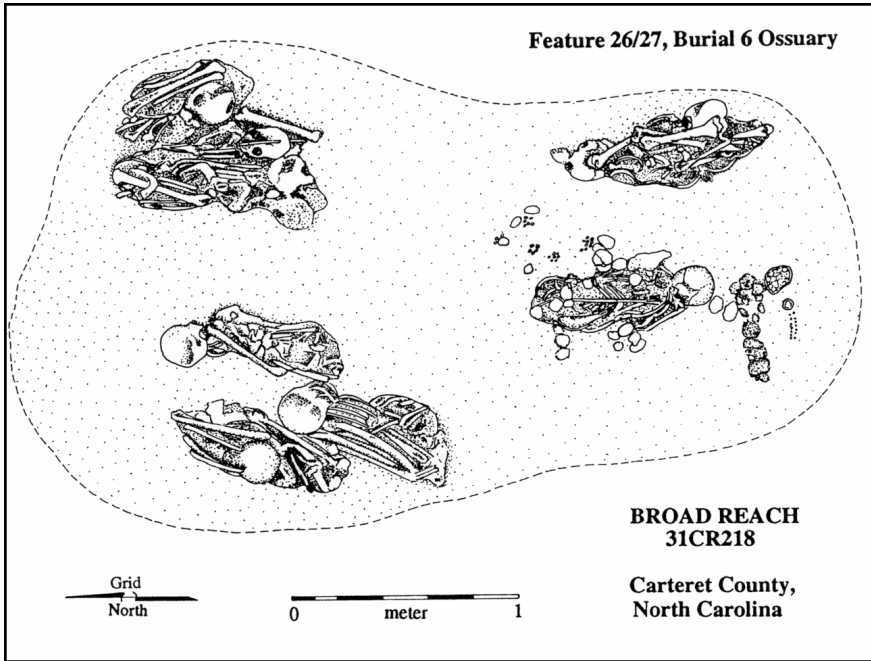


Figure 4. Drawing of the bundled human remains found in Burial 6 (from Mathis 1993). Used with permission of the National Park Service.

2A is a male aged 24–30 years old at death. Bundle 2B is a female aged 16–18 years. Bundle 3A is a male aged 18–24 years at death. Bundle 4 is a 24–30 year-old male. Bundle 5 (primary individual) is a female aged 30–35 years at death. Bundle 6 is a 20–24 year-old female, and Bundle 7 is a male aged 35–40 years at death. Bundles 1A and 1B were accompanied by a number of funerary objects, including a turtle shell, cut-shell disc beads, a greenstone "cup" which may have been part of a necklace with the disc beads, and a fragmented White Oak series shell-tempered, fabric-impressed pot. Bundle 3A was either wrapped in or laid upon a cloth or cape to which several hundred *Marginella* shell beads were attached.

Cemetery Area 3

This small cluster of burials was found close to Cemetery Area 1, southwest of Burial 8.

Burial 2 was a poorly preserved individual that probably was placed in a flexed, articulated position with the head oriented to the east. A cobble was found near the burial. This individual was aged 8–12 years old at death, and sex was not determined.

Burial 14 also may have been buried in a flexed position. A whelk shell was found with this burial. This individual was an adult, and sex could not be determined due to poor preservation.

Burial 15 was so poorly preserved that burial position and sex could not be determined. This individual was 35–40 years old at death.

Non-Cemetery Area Burials

Three burials containing four individuals were discovered outside the designated cemetery areas.

Burial 8 contained two individuals (designated 8 and 8A) in a single pit. The burial lay to the northeast of Cemetery Area 3. This is the only burial at Broad Reach that is definitely not a Late Woodland feature. Bone from Burial 8 was radiocarbon dated to 1420±90 B.P. (cal A.D. 445). Burial 8 was in a flexed position and Burial 8A was tightly flexed. Two clay-tempered Hanover series pottery vessels, at least eight turtle shells (six of which were bundled together with a beaver tooth, deer bone, and antler), and a *conus* shell were discovered between the two individuals. Burial 8 was a female aged over 45 years old at death. Burial 8A was also a female, aged over 40 years at death.

Burial 10 was buried in a flexed position with the head to the northwest, the left hand by the face, and the right hand by the knees. The burial was located south of Cemetery Area 3. A turtle shell was found in the burial pit. This individual was a 40–50 year-old female.

Burial 16 was buried in a flexed position with the head to the north, lying on the right side, with the left hand by the face, and the right hand down by the waist. Bone from this burial was radiocarbon dated to 410±70 B.P. (cal A.D. 1398). The individual was a 40–50 year-old female.

Mortuary Analysis Potential

The variety in burial form and the relatively good preservation of most of the human skeletal remains provide an excellent opportunity to examine the unusual burial pattern through both mortuary-archaeological and bioarchaeological methods. Often, analyses of burial practices are

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investigated either through the archaeological or the skeletal evidence. By combining these two data sets, a fuller analysis of the burial pattern is possible. The logic behind the analysis can be best explained by taking the two data sets separately because the methods have not often been used together. Studies of mortuary practices sometimes neglect the rich trove of information available from the skeletal remains. The age and sex distributions may be incorporated, but the pathological and dietary evidence are often ignored. On the other hand, physical anthropologists have often overlooked the archaeological context of burials and focused solely on skeletal information. This is probably due to the specialized training practitioners receive in separate subfields of anthropology, and may change in the future with the introduction of cross-subfield programs such as bioarchaeology into anthropology graduate programs.

Limitations of the Data Set

There are several problems related to interpreting the data obtained in this study. The biggest obstacle is the lack of dates for many of the burials. Because the site was used over a long period of time, it is difficult to evaluate the presence or absence of status differentiation without knowing which burials to compare to each other. Two types of contemporaneity can be distinguished for the site. First, *cultural* contemporaneity of the burials, except Burials 8 and 8A, is established through the presence of White Oak series pottery and the radiocarbon dates (Eastman 1994; Mathis 1993) (see Table 1). Burials 8 and 8A are clearly Middle Woodland burials due to the presence of Hanover series pottery and the radiocarbon date of 1420 ± 90 B.P. The other burials all belong to the same archaeological phase. *Chronological*, or absolute, contemporaneity cannot be assumed because the radiocarbon dates for the Late Woodland burials and features range from 1020 ± 90 B.P. to 480 ± 50 B.P. Dated, single, flexed interments occur both prior to and after the dated ossuary (Burial 6). Even within the same cemetery area, the dates range widely. Both Feature 118 and Burial 13 were in Cemetery Area 1. On the other hand, none of the features excavated in the cemetery areas overlap, and the burials are all at a distance from the habitation features, with the exception of Burial 16. This may indicate awareness and use of the burial areas for an extended period of time. Other sites on the coast are not comparable, so the pattern at Broad Reach cannot be associated with dated burials at other sites. There also

is no clear chronological pattern in the burials; therefore, the broader, more encompassing cultural contemporaneity is used as a framework for the analysis.

A limitation of the skeletal data is the differential preservation of the skeletal remains. Burial 6 individuals are better represented and better preserved than the other burials, making comparison difficult. Also, because most other coastal plain sites were not as thoroughly excavated, caution must be used in comparing the data available from Broad Reach with other sites. The fact that this site appears unique may be illusory. Other examples of similar burial patterns may not have been uncovered yet.

Health and Nutritional Indications of Status

The use of health and nutritional indications of status is tied to the proposition that in a nonegalitarian society, higher-ranked people will have better access to high-quality food resources, especially proteins (Peebles and Schoeninger 1981; Powell 1988). Differential access to food resources has been suggested by trace element analyses which infer a greater percentage of animal protein in the diet of elites compared to non-elites in several Southeastern chiefdoms (Hatch and Geidel 1985; Peebles and Schoeninger 1981). One Southeastern example comes from the Dallas culture in eastern Tennessee. Studies of stature, cortical thickness of long bones, and Harris' lines indicate a pattern of differential diet and health related to sociopolitical status (Hatch and Willey 1974; Hatch et al. 1981, 1983).

Methods of detecting status differences in health and diet are not absolute. They rely on discerning general trends and differences between groups. If a lower-status group lacked adequate protein, members will exhibit signs of growth disruption during development. Higher-status group members usually had adequate nutrition and, consequently, had better health and resistance to disease and infection. Therefore, the elites will not exhibit indications of growth disruption. For bioarchaeological studies, growth disruptions are most useful when there is more than one indication or incidence of disruption (Larsen 1987). When several indications are considered, a single episode of severe illness will be unlikely to skew the picture of relative, overall health differences between groups.

The concept of stress is important to studies using differential health

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and nutrition as a means of identifying rank differentiation in a population. Stress is described as a disruption of the normal behavior and homeostasis of an organism (Seyle 1956), or "the physiological disruption of an organism resulting from environmental perturbation" (Huss-Ashmore 1982:396). It is a challenge to the routine functioning of the organism. There is a synergistic relationship between health and nutrition. Inadequate nutrition is one of several factors which can lower an individual's resistance to disease (Powell 1988). Conversely, disease can affect a person's nutritional state (Goodman et al. 1988; Steinbock 1976). In an immature organism, stress can be particularly harmful. If the stress is severe enough, or chronic, the result can be a sacrifice of growth for maintenance of day-to-day biological requirements for survival (Powell 1988). Acute episodes of stress during development can leave permanent traces in an organism's bones and teeth. Chronic stress can result in retarded growth and a failure to reach the potential size allowed by genetics.

In this study, linear enamel hypoplasia (LEH), stature, and Harris' lines of arrested development are used to evaluate differences between subgroups of the burial population and to consider the possibility that the individuals in Burial 6 were of higher status than other members of the population.

Linear Enamel Hypoplasia

Linear enamel hypoplasia is a "deficiency in enamel thickness due to a disruption of ameloblast activity" (Goodman et al. 1980:516). It appears as a visible line or pit in the enamel of a tooth formed during a slowing or cessation of normal enamel deposition during tooth formation.

The slowing or cessation is due to a severe episode of stress caused by illness or lack of proper nutrition. The enamel malformation lasts for the duration of the stress and then normal enamel deposition resumes after the stress ends (Steinbock 1976). The result of the enamel malformation is a defect in the surface of the tooth crown. This defect marks the stage of formation of the tooth crown at the time of the stress. Therefore, it is possible to determine the age of the individual at the time of the stress.

A defect was measured when it was visible to the naked eye. The distance from the center of the enamel defect to the center of the cemento-enamel junction (CEJ) was measured. The chart provided in Goodman et al. (1980:520) was used to estimate the age-of-onset of the stress in quarter-year increments. A pattern in the age-of-onset was

sought for each individual. Of the 32 individuals evaluated in the Broad Reach sample, the presence of LEH could not be determined for 18 individuals, either due to the absence of teeth, or to excessive wear. The teeth of two individuals did *not* exhibit LEH. Twelve individuals had at least one episode of LEH.

Of the 12 exhibiting LEH, all but one (Burial 7) had more than one episode and more than one tooth was affected. Burial 7 was missing many teeth postmortem, and it is possible that the missing teeth also exhibited LEH. The pattern of LEH varied in each individual, but most occurred between the ages of two and four years. This is similar to many other samples from agricultural populations (Larsen 1996).

The distribution of LEH by sex does not reveal any evidence of sex bias in disease or access to nutrition. Eight of the 12 individuals exhibiting LEH were interred in Burial 6. These eight constitute a majority of the 14 individuals who had teeth which showed LEH. This finding does not indicate that Burial 6 contains individuals whose diet during childhood was substantially different from the rest of the individuals. Nearly every individual which could be evaluated for LEH indicated at least one episode of disease or nutritional stress severe enough to disrupt enamel deposition.

Stature

The adult stature an individual achieves is controlled by several factors. Maximum height usually is reached by 25 years of age (Hatch and Willey 1974:119), after which an average of 1.2 cm is lost every 20 years (Trotter and Gleser 1951).

Differences in diet and illness during infancy, childhood, and adolescence among subgroups in the same population can result in differences in adult stature due to depressed growth rates in the malnourished subgroups (Larsen 1987). Recent studies have shown that nutritional supplementation in children from the same areas leads to taller average adult stature among the supplemented children (May et al. 1993). Because stature can be estimated from skeletal remains, it is a useful tool for seeking differences in perceived subgroups. Controlling for age and sex, average stature will be greater for a high-status group compared to a lower-status group, provided the high-status groups had better nutrition and health during growth (Bogin 1988). Stature was determined for each individual where possible by measuring the maximum length of each complete long bone using an osteometric board

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as described in Bass (1987). Stature estimates based on these maximum lengths were then obtained from the chart provided in Krogman and Iscan (1986), which was modified from Genoves (1967:Tables 12 and 13).

Stature could only be estimated for seven individuals (see Table 3). Of these, six were from Burial 6, rendering meaningful comparison between Burial 6 and other burials impossible. However, the stature estimates did reveal one item of interest: Burial 6, Bundle 1A, a female, was taller than all of the other females and all but one of the males for whom stature could be estimated. No conclusions about differential health or nutrition, or stature averages, can be drawn from this small sample.

Harris' Lines of Arrested Development (Transverse Lines)

Harris' lines are a third indication of growth disturbance caused by poor health or nutrition during development. Following similar processes as linear enamel hypoplasia, Harris' lines represent sites of resumed growth after a period when cancellous bone growth has ceased or been retarded at the junction of the growth cartilage and the metaphysis (Harris 1933; Larsen 1987; Steinbock 1976). These disturbances appear on radiographs as radiopaque transverse lines. They are most often found in the femur and tibia, followed by the radius and metacarpals (Clarke 1978). Studies with rats show that these lines can be formed during dietary deficiency or disease (Steinbock 1976). The age of the stress can be estimated by determining the length of the bone at the time of the stress, then comparing the length to charts which are designed to estimate the age of a subadult by the length of the long bones (Johnston 1962). A drawback of this method, which makes it less reliable than linear enamel hypoplasia or stature, is that these lines are gradually removed by bone remodelling, and in clinical studies the lines rarely last more than ten years (Steinbock 1976). Therefore, these lines are useful as indicators of stress when present, but childhood stress cannot be ruled out by their absence (Larsen 1987). To document transverse lines, both ends of all intact femora, tibiae, fibulae, and radii were radiographed. A transverse line was counted if it extended at least halfway across the shaft transversely (Hunt and Hatch 1981). The age-of-insult corresponding to the transverse line was estimated following Hunt and Hatch (1981).

Table 3. Stature Estimates (arranged in ascending order).

Context	Sex	Stature
Burial 16	Female	154–156 cm
Burial 6, Bundle 5	Female	157 cm
Burial 6, Bundle 2A	Male	169 cm
Burial 6, Bundle 4	Male	169–170 cm
Burial 6, Bundle 3B	Male	169–173 cm
Burial 6, Bundle 1A	Female	169–175 cm
Burial 6, Bundle 7	Male	174 cm

Only four of the 32 individuals had long bones which were complete enough to evaluate transverse lines. The complete long bones of the four were radiographed, and the bones of three of the four exhibited transverse lines. The age at which the episode of severe stress occurred could only be estimated for two of the individuals. The third individual (Burial 6, Bundle 4) had three faint lines on the right distal femur, but these do not extend more than halfway across the diaphysis. The lines occurred at age 7.5 to 8.5 years on the tibia of Burial 6, Bundle 3A, and at age 11 to 12 years on both tibiae of Burial 6, Bundle 3B-1. The transverse lines occurred at older ages than the linear enamel hypoplasia for these individuals. These data are uninformative because all three individuals are from Burial 6. All three were male, but the sample is too small to draw any conclusions from this finding.

Pathological Indications of Status

The pathological conditions of treponemal infection and dental caries were also examined for further indications of differential diet and health.

Treponemal Infection. Endemic syphilis, a type of treponemal infection, is a pathological condition prevalent among Late Woodland individuals excavated from coastal North Carolina sites (Bogdan and Weaver 1992). The bones of 13 individuals at Broad Reach exhibited periosteal or inflammatory responses which are indicative of a treponemal infection. Of these, eight individuals were from Burial 6. The element most often involved was the tibia, closely followed by the fibula (see Table 4). The individuals in Burial 6 clearly had a higher prevalence of the infection than the population as a whole. The pattern

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Table 4. Occurrence of Probable Treponemal Infection by Skeletal Element.

Element	Number of Bones at Site	Number Affected	Percentage Affected
Temporal	27	2	7.4
Radius	34	3	8.8
Ulna	39	5	12.8
Humerus	36	2	5.6
Femur	38	9	23.7
Tibia	34	19	55.9
Fibula	28	14	50.0
Metacarpal or Metatarsal	17	9	31.7

of infection fits the etiology of an endemic disease that is prevalent in childhood (Bogdan 1989; Hackett 1951).

Caries. All six individuals (for a total of 18 teeth) which display dental caries were found in Burial 6. In a worldwide survey, nearly all agricultural populations have greater prevalence of caries than nonagricultural groups (Turner 1979). Table 5 presents the percentage per tooth of teeth affected by caries, excluding Burials 6, 8, and 8A (143 teeth). Burials 8 and 8A were not included because they are not from the same archaeological phase as the rest of the burials. Only one tooth in the entire population (excluding Burials 6, 8 and 8A) had a carious lesion. Table 6 shows the percent per tooth for only the Burial 6 teeth (209 teeth). Based on the discrepancy in caries frequency alone, it seems likely that the Burial 6 sample had a different diet than the rest of the sample. But, these data clearly do not indicate that the individuals in Burial 6 were healthier and better nourished.

The finding that 8.6% of the Burial 6 teeth were carious indicates that the individuals buried there likely had an agricultural diet (Larsen et al. 1991). The only direct archaeological evidence of maize at the site comes from Feature 590, which contained charred corn cobs. This feature was dated to 500±50 B.P. (cal A.D. 1444) (Eastman 1994). Burial 16 is the only dated burial which is later than Burial 6. Burial 16 (410±70 B.P.) dates to about 200 years after Burial 6 (670±80 B.P.). Therefore, the teeth from Burial 16 also would be expected to show a high frequency of dental caries. Unfortunately, Burial 16 represents an older person with a great deal of dental attrition, and most of this

Table 5. Occurrence of Carious Lesions by Tooth (excluding Burials 6, 8, and 8A).

Maxillary Teeth				Mandibular Teeth			
Tooth	n	with lesion	%	Tooth	n	with lesion	%
1st Incisor (I1)	10	0	0	1st Incisor (I1)	5	0	0
2nd Incisor (I2)	10	0	0	2nd Incisor (I2)	9	0	0
Canine	15	0	0	Canine (C)	10	0	0
3rd Premolar (P3)	6	0	0	3rd Premolar (P3)	9	0	0
4th Premolar (P4)	8	0	0	4th Premolar (P4)	9	0	0
1st Molar (M1)	8	0	0	1st Molar (M1)	7	0	0
2nd Molar (M2)	11	0	0	2nd Molar (M2)	9	0	0
3rd Molar (M3)	11	1	9.1	3rd Molar (M3)	6	0	0

Table 6. Occurrence of Carious Lesions by Tooth for Burial 6 Teeth.

Maxillary Teeth				Mandibular Teeth			
Tooth	n	with lesion	%	Tooth	n	with lesion	%
1st Incisor (I1)	7	0	0	1st Incisor (I1)	5	0	0
2nd Incisor (I2)	15	0	0	2nd Incisor (I2)	9	0	0
Canine (C)	18	0	0	Canine (C)	13	1	7.7
3rd Premolar (P3)	15	0	0	3rd Premolar (P3)	12	0	0
4th Premolar (P4)	15	0	0	4th Premolar (P4)	10	1	10.0
1st Molar (M1)	16	3	18.6	1st Molar (M1)	13	3	23.1
2nd Molar (M2)	15	0	0	2nd Molar (M2)	16	4	25.0
3rd Molar (M3)	14	2	14.3	3rd Molar (M3)	16	4	25.0

individual's molar teeth were lost antemortem. However, this loss could have been due to dental caries.

Cultural Indications of Status

Mortuary archaeologists use the funerary context to analyze aspects of past social systems. The methods used are based on the "assumption that an individual's treatment on death bears some predictable relation-

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ship to the individual's state in life and to the organization of the society to which the individual belonged" (O'Shea 1984:3). Archaeologists have conducted ethnoarchaeological studies and worldwide cultural surveys of mortuary practices, and their findings have been applied to archaeological sites (Binford 1971; Peebles and Kus 1977; Saxe 1970).

The initial assumptions in mortuary analysis came under considerable criticism in the early 1980s, at the same time processual archaeology was under scrutiny and for the same reasons (Trigger 1989). It was argued that processual archaeology often failed to take into account the importance of ideology in society (Hodder 1982; Shanks and Tilley 1982). This was especially true in mortuary analysis since disposal of the dead is often a ritually dominated practice (Hodder 1982).

The use of the dead by the living can obscure the social organization or complexity of a society, as reflected by mortuary practices. After all, what happens to the dead is what the survivors do with the body. The survivors may reinforce their own position by demonstrating their relationship to the dead (Metcalf and Huntington 1991). Or it may be in the survivor's interest to downplay the wealth or position of the dead (Shanks and Tilley 1982). This may lead to "masked rank" where social inequalities are present in the society, but the resulting internal tensions are neutralized by the appearance of egalitarianism in the mortuary (and other) ritual (Trinkaus 1995). In this way, ritual can be a reflection of how things *should* be, or how some want them to be, but not how they actually are. Ritual is an idealized expression of power relations and in these expressions the dead are subject to manipulation by the living (Pearson 1982).

These arguments have validity in that they point out the limitations of mortuary interpretations and caution against neglecting ideology. However, middle range theory and ethnoarchaeology have sought to discover links between social complexity and mortuary evidence. Extensive studies have shown that regularities exist which connect a living society to its method for disposal of deceased members. The following relationships have been established (O'Shea 1984:21):

1. Mortuary differentiation is patterned, and its elements are integrated with other aspects of the socio-cultural system.
2. The mortuary differentiation accorded an individual, although not necessarily isomorphic, is consistent with his (sic) social position in the living society.

3. The complexity of the system of mortuary differentiation will increase with the complexity of the society at large.

Several of the original proponents of mortuary analysis have responded to the post-processual criticisms. A recent, edited volume addresses these concerns and incorporates more consideration of the importance of ritual and symbolism in mortuary analysis, especially through the use of a regional approach (Beck 1995). The regional approach appears to be useful in avoiding some of the pitfalls involved in the analysis of a single site. By assessing the mortuary practices of an area, differences and similarities across the region are the focus of interpretation. Using a wider scope lessens the chance of basing an interpretation on anomalous burials, as well as providing a means for evaluating change through time. A third positive aspect of the regional approach is that it provides a way to test hypotheses generated at one site through comparison with other sites in the area (Goldstein 1995). However, data must still be gathered at single sites in order to construct hypotheses.

Energy-Expenditure Principle

One methodological approach to assessing past social systems is the energy-expenditure principle (Tainter 1978). When used in conjunction with skeletal evidence of health and nutrition, and age and sex distributions, the result is a detailed assessment of the mortuary practice at a site. That mortuary practice can then be compared to the results of similar studies at other sites; thus, it can be used in regional approaches to mortuary variability. The energy-expenditure principle uses an ordinal scale to assess the different amounts of time and effort spent on the following features: "complexity of body treatment, ...form and or location of the interment facility, ...and material contributions to the ritual" (Tainter 1978: 332). This principle is limited in its usefulness due to the fact that an unknown amount of energy expended in the ritual will *not* be reflected in the archaeological record. It is easy to imagine (and document) ceremonies involving any number of intricate steps to a mortuary ritual which would either be indiscernible in, or completely absent from, the archaeological record. However, this is no reason to abandon this rich line of inquiry into past social systems, or to confine conclusions to documenting variety without seeking connections to social dimensions.

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Application of the energy-expenditure principle is intended to rank body treatment, burial form, and funerary objects to discern a pattern in the mortuary data. Other factors certainly were important to the participants in the burial process. Individual considerations such as emotion, kinship ties, and religion are more difficult to discover, but possible connections with these factors are discussed.

Body Treatment. At the Broad Reach site, there was a variety of body treatments ranging from minimal preparation to disarticulation and bundling. Different burial forms and skeletal treatments were ranked according to the effort and time necessary. For example, it took more energy to dig the deep pit for Burial 6 and place the previously disarticulated individual bundles in it than to dig a shallow pit and place an intact body in it. The estimated number of steps required to arrive at the final disposition of the remains was another factor used in creating the ranking of the burials.

The remains of the individuals interred in Burial 6 were more extensively modified than other burials at the site. These remains may have been buried or laid out initially in a charnel house. The presence of many empty or mostly empty, burial-sized pits at Broad Reach suggests that individuals may have been temporarily buried (Mathis 1993). Prior to final interment in the ossuary, the remains were disarticulated and bundled. The presence of small hand and foot bones in the crania of one individual (Burial 6, Bundle 3B) suggests that care was taken to recover all the remains possible for reburial. Burial 1 individuals also were disarticulated prior to placement in the ossuary, but they were not bundled. None of the other individuals at the site were disarticulated, with the possible exception of Burial 5, a poorly preserved burial which may have been partially bundled. The available data on body treatment indicates that Burial 6 was the most time- and effort-consuming burial at the site.

Funerary Object Analysis. The funerary objects were ranked by consideration of factors such as quantity, effort needed for their manufacture, and effort needed to replace an inclusion (Tainter 1978). Another factor weighed was the origin of the raw material from which the object was made (i.e., local or imported). For example, more effort was required to make a pottery vessel to place in a burial than to find a common type of shell for inclusion.

Artifacts recovered from burials were divided into two categories: those which required significant time and effort to produce, and those which are essentially unmodified (see Tables 7 and 8). Two types of

Table 7. Ranking of Human-Modified Funerary Objects.

Funerary Object	Burial(s)
Copper beads	Burial 1
Greenstone "cup"	Burial 6, Bundles 1A and 1B
Cut shell disc beads	Burial 6, Bundles 1A and 1B
<i>Marginella</i> shell bead "cape"	Burial 6, Bundle 3A
<i>Marginella</i> shell beads	Burial 6, Bundles 1A and 1B
White Oak series pottery	Burial 6
Hanover series pottery	Burials 8 and 8A

Table 8. Ranking of Unmodified Funerary Objects.

Funerary Object	Burial(s)
Cobble/hammerstone	Burials 2 and 13
Shark teeth	Burials 3 and 13
Whelk shell	Burial 14
Whole clam	Burial 5
Turtle shell(s)	Burial 6, Bundles 1A and 1B, Burials 8, 8A, and 10
Deer antler/bone	Burials 8, 8A, and 13
Beaver teeth	Burial 8 and 8A
Dog skeleton	Burial 7
<i>Conus</i> shell	Burials 8 and 8A
Turkey bone	Burials 8 and 8A

artifacts had to have been imported into the area: the schist for the "cup" or ornament from Burial 6, Bundle 1A, and the copper for the beads from Burial 1. Green chlorite schist (or greenstone) and copper do not occur naturally on the coast of North Carolina (Stuckey 1965). The greenstone and copper beads are probably the most expensive goods, due to the effort and cost involved in importing the material. The greenstone cup may also be significantly older than Burial 6, perhaps indicating that it was a curated item (Mathis personal communication 1993). The production of the shell bead cape or cloth found with Burial 6, Bundle 3A, was also time consuming, more so than the simple strand of beads.

Burial Type. Aspects of burial form, including the size of the pit and

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the disposition of the individual(s) within it, also were analyzed with the energy-expenditure principle. Burial 6 definitely involved the largest time and energy expenditure at the site. It was the deepest and largest pit at the site. Burial 1 was the second most time- and effort-consuming. The rest of the burials were in similar-sized pits.

Discussion

Burial in an ossuary is a symbolic event. By commingling the remains of more than one individual in a single burial pit, a society affirms the cohesion and equality of the group. A common burial pit reinforces group identity and community (Bloch 1971). If the ossuary contains the remains of individuals from more than one village, it may symbolize cooperation, the need for mutual support, or perhaps group ownership of area resources (Trinkaus 1995). If the ossuary contains the remains of individuals from a single village, this may reinforce the equality of the group and cooperation among kin groups. An ossuary containing the dead of a single kin group separates that group from the others in the same village and symbolizes allegiance to family (Goldstein 1995). Burial on kin lands reinforces and legitimizes the kin group's ties to and ownership of that land (Loring 1985).

The way individuals in an ossuary are arranged, and the objects that accompany them, also are symbolically important. Burial 1 contained the scattered, disarticulated remains of at least four individuals. Copper beads were scattered over the bones. In this ossuary, the equality of the individuals is demonstrated by commingling the remains, and by scattering the copper beads randomly over the bones. Both adults and subadults are included in the pit. The minimum number of individuals in the pit is small, and it seems plausible that it may contain the remains of a single kin group.

Burial 6 fits the definition of an ossuary in that it contains the disarticulated remains of more than one individual, buried at the same time in the same pit (Ubelaker 1974). However, it is different from the Burial 1 ossuary in that individual identity is maintained in this ossuary. There are several groups made up of individuals. The infant (Bundle 1B) is associated with the adult female (Bundle 1A), but it is separate. Three individuals have grave goods associated with them, and the rest do not. Bundle 1A is associated with the most complete, and only discrete, infant burial, and it is accompanied by the largest quantity and most elaborate

grave goods. There is apparent cohesion in this group in that all individuals were buried in the pit at the same time, but they also maintained their personal identities with subsets of that group.

Burial 6 presents a fascinating set of seemingly contradictory characteristics. The archaeological evidence indicates that the individuals interred in Burial 6 were important members of the community. Great care and considerable time and effort went into the creation of the burial pit, bundling of the individuals, placement in the ossuary, and the production of funerary objects.

On the face of it, the skeletal data present a different picture than the one expected. Analysis of skeletal indications of differential health and nutrition was based on the premise that with higher rank comes greater access to food resources, which would serve to buffer the elite from shortage. Therefore, it was predicted that if the individuals in Burial 6 were of high rank, and if such rank was inherited, these individuals would show fewer skeletal and dental signs of inadequate nutrition and greater resistance to disease in childhood. The three indications (linear enamel hypoplasia, Harris' lines, and stature) of growth disruption which could have been helpful in drawing conclusions about social status have not proven to be useful. The distribution of linear enamel hypoplasia within Burial 6 is not lower than the distribution in the other burials, as expected. In fact, the it's occurrence is slightly *higher* in Burial 6. Harris' lines and stature distribution were of no assistance because the preservation of the remains did not allow meaningful comparison between Burial 6 and the other burials. However, the occurrence of treponemal infection is higher in Burial 6, suggesting perhaps that Burial 6 individuals were more susceptible to disease. The caries frequency data suggest that the Burial 6 individuals had a different diet than the others at Broad Reach.

Burial 6 individuals may have been sufficiently buffered from nutritional stress to survive the illnesses which killed others before the disease or pathological condition left a trace on their bones. In what has been called the "osteological paradox," Wood et al. (1992) argue that the skeletal remains which show signs of infection or growth disruption are those individuals which were healthy enough to survive a period of malnutrition or disease. Skeletal remains with no pathological indications may have been either healthy individuals *or* those who quickly succumbed to disease or malnutrition before it left a mark on their bones. Following this reasoning, it could be argued that Burial 6 is a status burial, and the better nutrition accorded to elites allowed them

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to survive malnutrition and disease slightly better than the non-elites. If buffering occurred in the form of better access to food resources due to social rank, this buffering was not complete. In other words, the children of the higher-ranked individuals may have had better nutrition than the children of non-elites, but it still was inadequate at times. It may have been enough, however, to allow them to survive episodes of severe stress which killed those not similarly buffered. This situation would account for the individuals in Burial 6 showing transverse lines and linear enamel hypoplasia.

Goodman (1993), in a reply to Wood et al. (1992), suggests that when multiple health and nutrition factors are considered at the population (not individual) level, the relative health of the group can be assessed. There are recognized ambiguities in paleoepidemiological reconstructions, but the paradox set up by Wood et al. is solvable with close attention to cultural and biological processes.

It is possible that the disproportionate amount of linear enamel hypoplasia, and number of pathologies, is due to the fact that the Burial 6 remains are in the best condition and most completely represented, whereas the other burials are not as complete. The other burials may have had more pathological conditions but the information has been lost due to deterioration and poor preservation.

Another possible explanation is that the Burial 6 individuals were actually more diseased and had poorer nutrition than the rest of the individuals in the other burials. Then, if the archaeological indications are accurate reflections of the social position of the individuals, higher-ranking individuals in this groups did *not* have better access to food resources than the rest of the population. In fact, they had worse nutrition and were more susceptible to disease. If this is the case, then one of the fundamental propositions of mortuary archaeological interpretations, which posits that differential treatment in death implies differential position and diet in life (Hatch and Geidel 1985; Hatch et al. 1988; Powell 1988; Peebles and Schoeninger 1977; Schoeninger 1979), may not apply in this situation. Another explanation for the differences in burial form would then be necessary. If the "elites" did have worse nutrition than others, I would expect that if other sites are discovered which display the pattern of burial types found at Broad Reach, the discrete burials and the smaller ossuaries with scattered remains will again show less pathological indications than the analog to Burial 6.

The frequency of caries in six of the Burial 6 individuals is likely due to the consumption of maize. If any of the other burials are found to

be chronologically contemporaneous with Burial 6, the diet of the Burial 6 individuals was greatly different and resulted in the production of caries.

Setting aside the cultural contemporaneity of all the burials, the most likely explanation is that conditions observed at the Broad Reach site are due to diachronic change. There is no compelling osteological evidence to suggest that the differences observed in the burials are due to status differentiation. It may be that burial form, body treatment, and funerary objects changed over time, and health and nutrition declined over time, perhaps due to increased consumption of maize (Cohen and Armelagos 1984; Larsen 1996). However, Burial 16, which is dated to a more recent time than Burial 6, did not display the same characteristics of poor dental health. Despite this, a single individual is not a suitable sample for this type of analysis. And, the question of how burial practices may have changed over time is not going to be answered by looking at a single site.

A regional approach which incorporates all the coastal sites is necessary to build a model of diachronic change in the prehistoric mortuary practices of coastal North Carolina.

Summary and Conclusions

The cultural and skeletal indications of status analyzed for the Broad Reach site do not agree. All the archaeological information examined, except the skeletal data, seems to support the proposition that Burial 6 was an elite or status burial. The indications of diet and status examined for the skeletal remains suggest that the diet of Burial 6 individuals was worse, not better as was expected. The frequency of caries in the Burial 6 individuals suggests that they were eating a diet at least partially dependent on agriculture, most likely maize. The greater occurrence of treponemal infection in Burial 6 suggests that these individuals also were more susceptible to disease. It is likely that the skeletal signs of poorer health and diet are accurate indications of the health of the population, and not marks of greater buffering, as suggested by an osteological paradox model. The frequency of dental caries is strikingly higher in Burial 6 than in the other burials at the site.

I suggest a model that incorporates all the available data which can be evaluated with information from other sites in the region. This model proposes that Burial 6 was an elite or status burial that was later in time than many of the other burials at Broad Reach. The native coastal North

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Carolínians who produced Burial 6 were probably practicing maize agriculture. Thus, the differences between Burial 6 and other burials may be due to both status differentiation *and* diachronic change.

One of the most important avenues for future research is establishing either relative or absolute dates for the burials, especially for Burial 1. These dates would allow further conclusions about the meaning of the various burial forms. For example, if it were discovered that Burial 1 was contemporaneous with Burial 6, this would be a strong indication that the differences in the burials was in fact due to status and not temporal differences, because of the variation in energy expenditure and health and nutrition factors. Another interesting area of inquiry would be to look at the changes which occurred through time in the burial practices at the site. If the two ossuaries were not contemporaneous, which came first? Was the group that was more symbolically egalitarian in burial practice earlier, or later? What else was occurring ecologically at the time of the ossuary burials? Was there a need for greater apparent or real cohesiveness at one time as opposed to another?

What is the role of agriculture in changes in burial practices? Prior to the adoption of maize agriculture, the group probably was less sedentary and subsisted on foraged and hunted resources. With a change in subsistence practices to agriculture, an individual's or group's relationship with the land may have changed. Perhaps kinship identity became a more important feature of burial symbolism.

Stable isotope analysis would also be informative on a number of levels. First, it would help establish what the diet of these people was, and perhaps when a shift to reliance on domesticated plant resources occurred. This analysis would address questions about the possibility of dietary differences between Burial 6 and Burial 1 individuals. This would help resolve the question of status by allowing a more direct measure of possible status differences in diet. It would also be interesting to evaluate some of the above suppositions about burial practices at the site before and after a shift in resource base.

This study has addressed the questions of social organization and mortuary process at a unique site on the coastal plain of North Carolina. Clearly, the combination of all aspects of the archaeological record, both cultural and skeletal, has produced a more complete understanding of the mortuary practices at Broad Reach than could have been obtained from either approach alone. Research at the Broad Reach site also has highlighted the importance of good relative and absolute dates for features and burials in the interpretation of mortuary process and social

reconstruction. While it is still unknown whether the differences in the burials is due to status differentiation, this study has outlined methods for evaluating this idea with sites excavated in the future, in accordance with a regional approach to mortuary analysis (Brown 1995).

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BOOK REVIEW

Ocmulgee Archaeology, 1936–1986, edited by David J. Hally. University of Georgia Press, Athens, 1994. xiii+237 pp., illus., tables, biblio., index. \$40.00 (cloth).

Reviewed by Christopher B. Rodning

Archaeology at Macon Plateau and surrounding areas of central Georgia began during the Great Depression as the most extensive field project of the federal archaeology program in the Southeast. Excavation projects designed primarily to provide jobs produced an abundance of collections but allowed limited time for analysis, and the pace of digging sites contributed to gaps in field notes and provenience information. Since then, little excavation has been conducted at Macon Plateau, and more recent publications refer sparingly to the 1930s undertakings. The federal archaeology program at Macon Plateau also included the establishment of the Ocmulgee National Monument in 1936, and a conference in 1986 commemorated the fiftieth anniversary of that event. The book *Ocmulgee Archaeology*, an outgrowth of this conference, is a testament to the many important lessons to be learned from the excavations at Macon Plateau and nearby sites, and from the scholars who have creatively and insightfully evaluated their significance.

The five historical chapters of the book examine the intellectual background to fieldwork as well as the daily routine of those involved in excavating the Macon Plateau mounds, the Stubbs mound, the Lamar site, and the several other localities investigated by crews stationed at Macon. Although the Macon excavations began as a federal relief project designed primarily to provide jobs, local interest in the area's prehistory preceded the Great Depression. As John Walker writes in his daily account of the routine of decades of Ocmulgee archaeology, several Macon residents were responsible for creating the Society for Georgia Archaeology in 1933 and also were early advocates for the study and preservation of prehistoric sites in central Georgia. Stephen Williams guides the reader through the intellectual developments that led to the arrival of a cadre of young archaeologists who would serve as catalysts for the unfolding of the early stages of Ocmulgee archaeology. This group included scholars such as James Ford, Gordon Willey, Preston

Holder, Antonio Waring, Jesse Jennings, Charles Fairbanks, and others who would spend some of the formative years of their distinguished careers enmeshed in the archaeology of Macon Plateau and nearby sites. Gordon Willey writes fondly of his experiences as a student of Macon director Arthur Kelly and later as field supervisor at Ocmulgee, and of the productive discussions among the various scholars who were directly and indirectly involved in excavations in the region. As he is well known for his contributions to archaeology elsewhere in the world, it is interesting that Willey writes that "I look back upon Macon as the place where I came of age—professionally and emotionally" (p. 46). Jesse Jennings, who began his year-long tenure as park superintendent in 1938, also writes fondly of his initially frustrating attempts to give some sense of direction to the various construction projects at the new park. As discussant for the conference, James Griffin parallels his earlier role as a significant outside influence on the archaeologists who were developing ceramic classification systems for Ocmulgee collections in the 1930s. From these historical essays, it is readily apparent that Macon was a gathering point for many of the leading figures in Southeastern archaeology of that day and of later generations. It is also clear that broader contemporaneous interests among archaeologists in ceramic classifications and chronologies, as well as Southeastern cultural distributions, found a testing ground at Ocmulgee from the outset.

A group of 10 essays examines the entire continuum of aboriginal culture history in central Georgia, beginning with the earliest settlement of the region. David Anderson and colleagues describe the significance of a number of Paleoindian and Archaic sites in Georgia and the Carolinas, and the great advances made since the discovery of a fluted Paleoindian point at Macon Plateau in 1935. They also review several models which archaeologists have developed more recently to explain Early Archaic settlement strategies.

Three of these essays concentrate on construction practices during the Woodland and Mississippian periods. Richard Jefferies discusses the differences between Woodland and Mississippian mound building and use. He describes several Woodland mound sites across the greater Southeast, with emphasis on the Swift Creek and Cold Spring mounds on the Georgia Piedmont. His chapter is a good reminder that earthen mounds are not temporally restricted to the Mississippian period. Mark Williams and David Hally examine the layout of the Mississippian mounds at Macon Plateau, suggesting a span of occupation long enough to allow for significant changes in the configuration of the mounds,

lodges, and ditches found at the site. Lewis Larson discusses so-called "earth lodges" at Macon Plateau and elsewhere, raising doubts that such structures represent a common architectural feature in the prehistoric Southeast. Larson notes the confusion in terminology employed by scholars who have loosely applied the "earth lodge" label to earth-covered structures, earth-embanked structures, or both. Drawing from descriptions of aboriginal architecture in the historic Southeast by Adair, Bartram, Hawkins, and Swanton, Larson offers alternative explanations for the "earth lodges" described at the Macon Plateau, Harris Farm, Garden Creek, and Wilbanks sites. His point is that "earth-embanked" structures are a common architectural style in the Southeast, but "earth-covered" lodges are not.

Two essays offer some insight into nutrition and the subsistence practices of those responsible for the Mississippian and historic sites at Macon Plateau. Thomas Riley discusses the implications of subsurface archaeological features identified as ridge-and-furrow fields in his chapter on agricultural field systems in eastern North America. He describes these features at Macon Plateau and midwestern sites such as Cahokia, Kincaid, and Sand Lake, and argues that the excavation of such archaeological features is crucial to understanding the coevolution of maize crops and the prehistoric farmers who tended them. Another dataset for evaluating the agricultural practices of Macon Plateau residents consists of the human remains from excavated burials in Mound D and at the Trading House at Macon Plateau. Mary Lucas Powell reviews records and collections of human remains and associated grave goods, and she recognizes mortuary patterns that are typical of Mississippian groups elsewhere. She suggests that the Macon Plateau osteological collections are sufficiently intact for isotopic studies which could contribute greatly to an understanding of dietary regimes of the past.

David Hally offers an exhaustive synthesis of several aspects of Lamar material culture, the expression of late prehistoric settlement throughout much of the interior Southeast and a precursor to the material culture typical of historic Native American traditions in the region. His chapter includes sections on Lamar ceramics, chronology, origins, geographic distribution and variability, subsistence, settlement patterns, mortuary practices, and ethnic correlates between Lamar assemblages and Muskogean groups of the early historic Southeast. The maps, charts, and illustrations in this chapter are valuable and helpful inclusions in the book.

Two essays are thematically oriented and address the topic of Mississippian origins. Mark Williams advocates migration as an explanation for this development at Macon Plateau. He comments on the limited distribution of Macon Plateau ceramics across a very restricted area immediately around the mound center itself. Given the extensive fieldwork that has been undertaken in this area, Williams expresses doubts that additional investigation will uncover the ceramic assemblages that represent the local transition between Late Woodland and Early Mississippian period settlement. Furthermore, he suggests possible continuities between local Late Woodland ceramics and Lamar assemblages postdating the A.D. 950–100 occupation of the mounds at Macon Plateau. Similarities between ceramics that predate and postdate the occupation of the Macon Plateau mounds lend support to his conclusion that those who constructed the site must have migrated from elsewhere and were not the descendants of later Lamar residents of the region. Gerald Schroedl presents the opposite view in his chapter, emphasizing parallels between Mississippian origins in central Georgia and eastern Tennessee. Schroedl proposes an application of the lessons learned from the development of research on this topic in eastern Tennessee. Scholars originally espoused migration as an explanation for the appearance of Mississippian groups in this region but have since constructed models of gradual development of Early Mississippian traditions from indigenous Late Woodland precursors. Schroedl suggests the possibility that Macon Plateau ceramics represent the local expression of this transition, as has been proposed for ceramics at the Martin Farm site and in submound deposits at Hiwassee Island in eastern Tennessee. As James Griffin and William Webb did during a visit to Macon years ago, Schroedl recognizes the "fundamental stylistic similarities, especially in the ceramics, between the Macon Plateau and Hiwassee Island cultures" (p. 142), and he suggests that both assemblages represent an Emergent Mississippian style. To conclude, Schroedl advocates employing an evolutionary framework to develop a single model of Mississippian origins applicable to datasets from the Macon Plateau, Hiwassee Island, and Martin Farm sites.

Three essays concentrate on historic native settlement at Ocmulgee. Charles Hudson draws from historic references and archaeological information to present a case for the identification of the Lamar site as the capital of the chiefdom of Ichisi, mentioned in accounts of the Hernando de Soto expedition from A.D. 1539–1543. He also suggests that the historically known chiefdoms of Coosa and Cofitachequi may be helpful

guides for understanding social and political organization in the prehistoric Southeast.

The Ocmulgee Fields culture was first identified from excavations at the Macon Plateau Trading House as historic Creek. In his essay on the development of Ocmulgee Fields culture and its connection to Creek ceramics, Vernon Knight defines several regional Lamar subtraditions. All of these subtraditions evince common trends leading towards a coalescence of the characteristics typical of historic Creek pottery. As an appendix to his chapter, Knight provides pottery type descriptions which complement his essay and his chronological chart of these Lamar subtraditions.

In his chapter on contact-period archaeology at Macon Plateau, Gregory Waselkov evaluates the Creek presence at the Macon Plateau Trading House between A.D. 1690 and 1716. He also commends the landmark efforts of archaeologists at Macon Plateau who from the outset undertook serious studies of historic Native American settlement at the site. As Waselkov writes, these scholars recognized a theme still significant to archaeologists, that of the cultural continuities and resiliency of native adaptations to increasing contact with European colonial groups.

Each chapter provides its share of stepping stones for further investigations. In drawing together his introduction to the volume, Hally comments that 50 years of archaeology have expanded and answered many of the questions asked by the first archaeologists who worked at Ocmulgee. He also puts forth two major questions that are still unresolved: what was the nature of Macon Plateau community patterning; and where did those responsible for the layout and construction of the Mississippian earthworks at Macon Plateau come from?

Ocmulgee Archaeology is a well-organized collection of clear and insightful essays covering the entire span of aboriginal human occupation in central Georgia, and it addresses several themes of primary concern to archaeologists throughout the history of fieldwork in the region. Investigations along the Ocmulgee River near Macon have played a significant role in the historical development of Southeastern archaeology. The problems and solutions of archaeology in this region have paralleled, and in some cases initiated, those of other localities across the greater Southeast. I strongly recommend this book as thoroughly enjoyable and essential reading for anyone interested in Southeastern archaeology and ethnohistory.